Vocational Interests of Men and Women

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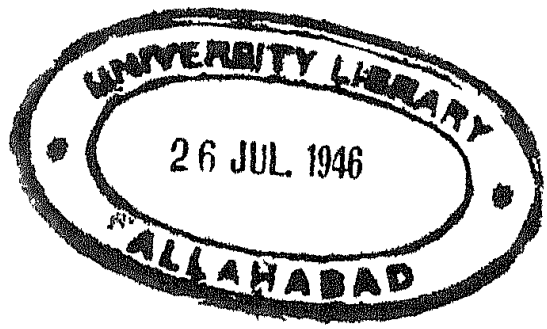

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Dedication

TO THE THOUSANDS OF
MEN AND WOMEN WHO HAVE
SO CHEERFULLY CO-OPERATED
IN THIS STUDY

Preface

Vocational guidance is needed by both young and old. Any improvement in such counseling aids the person himself, his future employer, and our whole educational program. Time and money are often wasted trying to prepare youths for careers which they or their parents desire today but not tomorrow, and for which too often the young people have no ability.

Ability and interest are both involved in vocational choice. The literature is voluminous regarding ability, even though very much needs to be added. On the other hand, until just recently there has been very little on the subject of interest.

Several notable contributions to applied psychology were made at Carnegie Institute of Technology during the years 1916 to 1923. At the farewell dinner of the group of psychologists there, under the leadership of W. V. Bingham, it was prophesied that the developments with regard to the diagnostic meaning of interests would prove to be one of the great, if not the greatest, of these achievements.

Two approaches had been made to the subject, along the lines of student guidance and commercial efficiency. J. B. Miner had worked out a questionnaire for students which would aid them in their vocational choices, using in his blank a variety of items representing interests. C. S. Yoakum was concerned with methods of selecting and training salesmen. Eventually his research students made use of interest items. Moore discovered that design and sales engineers could be differentiated in terms of differences in interests.

Freyd in his study of introversion-extroversion was able to differentiate life insurance agents from engineers. Here was the beginning of differentiation of men in one occupation from men in other occupations. The related but apparently far more difficult

task of differentiating the superior and inferior members of an occupation was attempted by Ream and Craig. To this day we do not know whether or not such differentiation is possible to any significant degree.

Shortly after the writer's arrival at Stanford University in 1923 he interested Karl M. Cowdery in investigating the possibilities of differentiating lawyers, engineers, and physicians in terms of interests. The success of Cowdery's thesis encouraged the writer to continue the research in order to discover, first, whether or not men in all occupations could be so differentiated and, second, whether or not such procedures could be made useful in vocational guidance.

This book recounts the results of nineteen years of investigation. The first draft of it was started six years ago; but so many new discoveries were continually being made that the whole scope of the book had to be revised again and again to include the new findings. Accordingly, some topics are discussed extensively, and others, less well known, are sketched in roughly. Obviously very much more remains to be done. But there are enough facts to indicate that interests play an important role in the direction of life and that, consequently, proper measurement of interests is distinctly helpful in the guidance of both young and old.

Study of interests was initiated in an atmosphere of applied psychology. Most of the worthwhile work has been directed toward the use of interests as a means of solving practical problems. Some "pure" psychologists should investigate experimentally the nature of interests and how they develop in early life.

As already stated, this book recounts the research of the writer. The contributions of others which relate to the writer's research are included here. Early work is touched on briefly, or omitted, as it was reviewed in 1931 by Douglas Fryer in his *Measurement of Interests*. Published research based on other interest inventories than that of the writer have been utilized wherever possible, but no attempt has been made to evaluate the various interest inventories now on the market. That needs to be done by a disinterested party.

Part One is a general introduction. Chapters 1 and 2 present the writer's conception of the nature of interests and their role in

guidance. Chapter 3 reviews the major conclusions of the entire volume. The next two chapters give such information as one needs to have in order to use the *Vocational Interest Blank.* Chapter 6 makes clear that all people in this country have interests very much in common. This fact has been overlooked rather naturally, as most applied studies have dealt with differentiable interests and have ignored the interests held in common.

The fact that men engaged in various occupations may be differentiated in terms of their interests is brought out in Part Two. Three nonoccupational scales are described in Part Three. They contrast the interests of the upper and lower socio-economic levels, of men and women, and of 15- and 25-year-old men. Chapter 14 attempts the difficult task of identifying the factors underlying specific interests.

The use of interest measurements in guidance is the general theme of Part Four. The first two of these chapters consider the permanence of interests and the validity of their use as a consulting device. The next two chapters describe the appropriate use of interest measures alone, or combined with other tests, in counseling. Part Five outlines the attempts which have been made to differentiate the superior from the inferior, occupationally and scholastically.

More recent research has shown that members of skilled trades cannot be differentiated very well by the procedure employed to differentiate men in the professions and the better-paid business pursuits. A new procedure is outlined in Part Six which may prove to be adequate. In any case the research in this connection has added greatly to our understanding of the whole subject.

Part Seven includes three chapters which consider various problems dealing with the construction and scoring of an interest inventory. A fourth chapter contains several minor studies which throw some light on the nature of interests. The final chapter, an appendix, includes various reference material which can be found more conveniently there than if scattered through the book.

The writer was able to carry out the extended investigation described because of two major financial contributions. Through the friendly interest of Henry Suzzallo, then president of the University of Washington, and of Frederick P. Keppel of the Carnegie Corpo-

ration, a grant of $18,000 was received from the Corporation in 1935. Over a period of years grants were made by the Council of Research in the Social Sciences amounting to $27,400. Smaller grants have been made by business and professional groups and by individuals. Many individuals have helped in securing the 23,000 blanks properly filled out which constitute the criterion groups. Some of those who have helped in this way are mentioned in the following pages. To these and all others the writer is greatly indebted.

Some people in various walks of life, including psychologists, have considered the study of interests as of "no scientific value," "extremely silly and pernicious stuff," "a sheer waste of time," "useless and inane;" nevertheless a third of all who have been asked to fill out the *Vocational Interest Blank* have done so without any recompense. A one-third return on any questionnaire is unusual; when the questionnaire requires twenty to thirty minutes to fill out, such a response means that many people believe interests are of indicative importance. Such co-operation has been most valuable, for without it mere money would have been of no avail.

Recognized statistical procedures did not seem to fit many of the research problems in which the basic data are three-way responses to interest items. Consequently much trial and error has been necessary in order to find the best way of dealing with the millions of figures which have been handled. Thanks are due to Karl M. Cowdery, Truman L. Kelley, P. J. Rulon, Ben D. Wood, L. L. Thurstone, George M. Kuznets, and Quinn McNemar for suggestions, many of which have been incorporated in the procedures.

Lewis M. Terman of Stanford University and Donald G. Paterson, E. G. Williamson, and John G. Darley of the University of Minnesota have always shown faith and interest in the research. They have given freely of their time in discussing new developments and have made many sound contributions to the whole field. It has been their enthusiasm that is most appreciated. Both Professor L. M. Terman, head of the Department of Psychology, and Dean J. Hugh Jackson of the Graduate School of Business, at Stanford University have supported the project through these many

years by arranging the writer's work so that the research could be continued.

Six women have borne the brunt of the statistical calculations, in which millions of figures have been manipulated in various ways and with a high degree of accuracy. Their names and the periods when they were in charge are as follows: Mrs. R. H. Seashore, September 1927 to August 1928; Mrs. J. K. Hall, September 1928 to August 1930; Mrs. R. W. Robinson, September 1930 to September 1935; my daughter Margaret, now Mrs. T. W. Harrell, October 1935 to June 1938; Mrs. H. A. Dunker, July 1938 to December 1941; and Mrs. W. T. Nicholson, January 1942 to the present time. Cordial appreciation is due to Dean Jackson for encouraging the publication of this volume under the auspices of the Graduate School of Business.

Harold D. Carter was employed as part-time assistant during 1934–36. He prepared a review of the literature which was originally planned as a first chapter. Eventually the book was reorganized along new lines and his material is now scattered throughout most of the book. Ronald K. Campbell was writing a summary of the literature for his Doctor's thesis at the same time the writer was organizing the material for chapters 19 and 20; because of the interchange of ideas that took place, part of that material and its organization must be credited to Campbell. Both he and Cowdery have read the manuscript and have made many valuable contributions, many of which have been incorporated in the text.

Permission to quote has kindly been granted by authors and/or publishers referred to in footnotes throughout the text.

E. K. S., Jr.

STANFORD UNIVERSITY
June 1943

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Part One

GENERAL INTRODUCTION

Part One is a general introduction to the subject. Chapters 1 and 2 consider the nature of interests and their role in guidance. Chapter 3 summarizes some of the findings in this research. Chapters 4 and 5 describe the use of the *Vocational Interest Blank* and how it is scored.

Since the current method of scoring interest tests is to measure the interests which differentiate two groups, it is only natural that differences are emphasized. Chapter 6 calls attention to the actual fact that all groups have far more similarities than differences in their interests.

Chapter 1. The Nature of Interest

Did anyone . . . . ever succeed who did not love his work better than anything else? Especially when everything is so intricate and apprenticeship so long as it is today, he who does not so love his work that it becomes play, so that he turns to it rather than anything else, cannot win the prizes of our day . . . . I think that the greatest good fortune that can befall a man is to be able to make as his vocation what he loves to do during his vacation . . . . If there is something you prefer to do to anything else, that way lies your calling.[1]

Can this ideal be realized by the genius alone, or is it possible for all? It certainly is not true today for many men and women. Any contribution toward making our work play is well worth while in terms not only of increased efficiency but of greater happiness.

Anyone familiar with the psychology of individual differences must recognize that equality is impossible; but we can strive for equality of opportunity for each to find the place where he will have the best chance of happiness and success. The more happiness is stressed, and not mere efficiency, the more concern educators must have for interests; for they are indicators of what activities bring satisfaction.

What are interests? What role do they play in human affairs? Are they ephemeral, or fairly permanent aspects of life? Can one's behavior be predicted if his interests are known? How do the interests of men and women, of boys and older men, compare? To what extent do men engaged in different occupations differ in their interests? How significant are these differences in interests? Do they result from differences in training and occupational experience or do they arise rather early in life and condition occupational choice? These are a few of the questions that concern us in this text.

[1] G. S. Hall, *Educational Problems* (D. Appleton and Company, 1911), 1, 288.

ROLE OF INTERESTS IN EDUCATIONAL AND PSYCHOLOGICAL THEORY

Human behavior involves, first, wants or desires which are to be satisfied by reaching some goal and, second, means to be used in reaching the goal. The former has reference to what man wants to do, his drives, aspirations, daydreams, ambitions; his pleasures and satisfactions; the causes of his behavior. The latter has reference to how he accomplishes these desires, his discovery of appropriate means to that end. The two phases of behavior do not have a common denominator: the former concerns motivation, the latter efficiency.

So often in the discussion of political and social issues one group stresses the desirability of the issue, as pensions for the aged, and the other group considers the inadequacy of the means proposed. There is no way of reconciling two such conflicting arguments—each antagonist considers the other as utterly preposterous.

This dichotomy, which we do not wish to stress unduly, has influenced thinking in many ways. The old conception of education, based on early philosophy, viewed human desires as evil, taught that the heart must needs be subordinated to the mind. The first step in educating the child was to "break his will." The second step was to force him into the mold of the adult. Consequently the more intellectually difficult and emotionally distasteful an activity or task, the greater its educational value. Emphasis was placed upon effort because the teacher regularly had to deal with a recalcitrant pupil, who naturally rebelled against the means presented for improving him, since they satisfied none of his desires (except that to escape punishment).

Rousseau (1712–1778) taught a new doctrine. "Education . . . . is a development from within, not an accretion from without; it comes through the workings of natural instincts and interests and not through response to external force; it is an expansion of natural powers, not an acquisition of information; it is life itself, not a preparation for a future state remote in interests and characteristics from the life of childhood."[2] Herbart (1776–

[2] P. Monroe, *History of Education* (Macmillan, 1909), p. 566.

1841) viewed education as the process of stimulating the spontaneous interests of the individual. Interest, he thought, is aroused in order to secure attention to the lesson but even more in order to secure complete appropriation of the new ideas. He still stressed virtue as the ultimate purpose of education but recognized the "many-sidedness of interest" as the means to that end. The old doctrine of effort stressed efficiency, appropriate means to an end; the newer doctrine stressed the individual and his satisfactions while still a child as well as when he is an adult. Resolution of the two doctrines into one is impossible; but they may be driven tandem. In the words of Monroe, "Interest is essential as the starting point of the educative process; effort is essential as its outcome. The purpose of appealing to the interest of the child is to lead him to the point where he will put forth effort to master the unsolved problems, the undetermined relationships of his environment."[3]

Truth seems to advance by fits and starts. One theory is advanced and then its opposite. The pendulum swings violently from one extreme to the other. Truth, however, is apt to reside in between, as Aristotle pointed out so long ago. It is easy to uphold an extreme view; it requires broader-gauge thinking to resolve conflicting views.

Another example of this phenomenon which concerns us here, relates to behaviorism, on the one hand, and "goal-seeking," on the other. Man's behavior is unquestionably a resultant of forces from his environment and from his own peculiar constitution. Behavioristic psychology stressed environmental forces. Man was viewed very largely as an inert mass of protoplasm which responded only when stimulated. The concept of interest could have little or no place in such a system, for interest connotes activity arising from within and no good behaviorist could admit that anything in consciousness could influence behavior. William James, on the other hand, stressed the spontaneity of the human organism. The higher faculties of the mind are not "pure products of 'experience' "; experience is not "of something simply given." James said further:

[3] *Ibid.*, p. 752.

Millions of items of the outward order are present to my senses which never properly enter into my experience. Why? Because they have no *interest* for me. *My experience is what I agree to attend to.* Only those items which I *notice* shape my mind—without selective interest, experience is an utter chaos. Interest alone gives accent and emphasis, light and shade, background and foreground—intelligible perspective, in a word.[4]

Early experiments in human psychology measured reaction-time, attention, memory, habit-formation. In these studies motivation was largely ignored. Students were told to do certain things, and they docilely responded. In early animal psychology rats ran mazes and their time and error records were carefully kept in order to throw light upon how they learned to reject the wrong and accept the right pathways. Eventually the question arose, Why do the rats run? This introduced the entirely different problem of what rats want to do, what goals they will seek, the relative importance to rats of various goals, and so on. Here in psychology we have had two extreme views of man—the first, that stimuli explain his actions; the second, that his internal mechanism is responsible for these actions. The dichotomy is akin to that upheld by educators. Early experimental psychology, culminating in behaviorism, was concerned with the *means* used to reach a goal. Here work, effort, learning, are involved. The student, or rat, did not have to possess a consciousness; he was merely utilizing his reflexes and old habits and developing new skills. But when motivation is emphasized, the structure of the organism and its functioning must be considered: What does the organism want? What goals does it seek? What pleasures and satisfactions are involved? Learning is no longer an end in itself, learning is the process of discovering a means of reaching a goal. Learning and motivation cannot be reduced to one set of terms, except in the sense that achievement is the resultant of both. The former has reference to effort and efficiency, the latter to desires, interests, satisfactions.

WHAT IS AN INTEREST?

Experimentally an interest is a response of liking; an aversion is a response of disliking. Students are asked, "Which school subject do you like best?" "Which occupation do you prefer?" In filling out an interest inventory one indicates whether he likes, is

[4] W. James, *The Principles of Psychology* (Henry Holt & Co., 1908), 1, 402.

indifferent to, or dislikes an item. In all measurements of interests it is assumed that one of these three responses may be made to each item and that among a number of people all three responses will be found to each item.

Interest is present when we are aware of an object or, better still, when we are aware of our set or disposition toward the object. We like the object when we are prepared to react toward it; we dislike the object when we wish to let it alone or get away from it. Fryer writes that "objective interests are acceptance reactions and objective aversions are rejection reactions."[5]

Most items on an interest inventory are nouns, the names of things. But an activity toward or with the object is assumed—to a list of occupations one is asked if he would like or enjoy that kind of work—otherwise there can be no liking or disliking.

Feeling, interest, want or desire, attitudes.—These four terms all involve acceptance-rejection; they differ with regard to the complexity of the stimulus and that of resulting behavior. The response of pleasantness-unpleasantness is usually to a simple stimulus, as the odor or color of a rose; but it may occur when one is paying little attention to a complex stimulus, as when one is busily engaged while the radio is playing a symphony concert—the music is pleasant but is not even recognized. The response of liking-disliking is to objects in terms of the activities, or response tendencies, involved. Activities concerned with objects are means to some end. If they are enabling us to reach some goal, they are liked; otherwise not. Wants or desires were classified long ago by Craig as appetites or aversions. In the former case one seeks an appropriate stimulus, in the latter case one avoids a stimulus at hand. The response of belief-disbelief pertains to our attitude toward relationships. Ferguson quotes E. W. Hall's definition of attitude as "the acceptance value of a belief."[6] We don't believe odors or "adjusting a carburetor," but such conceptions as "Columbus discovered America." In each of the cases designated by our four terms the organism goes toward or away from, continues the *status quo* or discontinues it, accepts or rejects the proposition.

[5] D. Fryer, *Measurement of Interests* (Henry Holt & Co., 1931), p. 849.

[6] L. W. Ferguson, "The Requirements of an Adequate Attitude Scale," *Psychological Bulletin* (1939), **36**, 665.

Interest is an aspect of behavior, not an entity in itself. When a person salutes the flag as it is carried by, he exhibits a perception in sensing the flag, a habit in moving his arm, a memory in remembering the flag and the custom of salutation, an interest in liking to engage in a military ceremony, an attitude in that he has a tendency to act in a patriotic manner, and a sentiment in that he feels a thrill at seeing the flag. Such a person doesn't have six kinds of acquired behavior; he has only one, but that one can be referred to under six different terms according as one or another element of the whole process is emphasized.

A half-dollar has a woman, a date, "Liberty," and "In God we trust" depicted on one side and an eagle, "E pluribus unum," etc., on the reverse side. Because we can examine the whole coin no one would ever dream of carrying on elaborate statistical studies of variations in detail of the eagle or the date on coins in order to describe and explain the nature of half-dollars. But because we cannot today examine an entire unit of human behavior we are forced to study such aspects of the whole unit as are available. Perceptions, habits, memories, interests, attitudes, and the like are analogous to the woman, eagle, date, etc., on the coin. But the former are no more separate entities than the latter; each is an aspect of a larger whole. Studying the "woman," the "eagle," etc., alone gives an inadequate notion of a half-dollar: similarly, studying habits or interests alone gives an inadequate notion of a unit of human behavior.

In well-established behavior units such as reflexes and habits there is very little awareness of the aspect of acceptance-rejection and consequently we are rather at a loss when asked if we like or dislike winking our eye, or thinking "Columbus" when we hear "1492," or turning the steering wheel to avoid a rut. But when we are engaged in learning, in so-called purposive behavior, interest is present because the essence of such behavior is rejecting the wrong and selecting the right.[7]

Feeling, interest, want, and attitude all involve a physiological

[7] In the ordinary functioning of an experienced driver, turning the wheel is accepting the smooth road and rejecting the rut but the driving is done automatically; on a tough stretch of road there is true acceptance-rejection, characterized by interest-aversion.

mechanism. Such mechanisms may be dormant or aroused. When aroused certain overt behavior results and at the same time we are conscious of pleasantness, interest, satisfaction, belief, according to the type of response involved. The term dormant implies that the mechanism exists; and when it is aroused, action results in accordance with its structure. Thus one may have an interest in collecting postage stamps without thinking of or reacting to it all the time; but when an appropriate stimulus comes along, one will tend to act in a positive direction toward such collection.

After listing 23 characteristics of attitudes from 30 sources Nelson gives us this definition:

> An attitude may be considered a felt disposition arising from the integration of experience and innate tendencies, which disposition modifies in a general way the responses to psychological objects.[8]

The definition can be applied also to the terms "interest" and "habit." All three are stabilized sets or dispositions resulting from experience and determining resulting behavior. Habits are not characteristically "felt" dispositions. Normally, habits are performed with little attention; but whenever the course of action is interfered with, they are felt. Similarly it is doubtful if a dyed-in-the-wool Republican is particularly aware of his attitude as he rebels against a New Deal doctrine: he is aware of his denunciations but not necessarily of the disposition which is responsible for the denunciations.

An interest test can be rearranged in the form of an attitude test. Thus the three interest items

	Like	Indifferent	Dislike
Taking alarm clock apart	( )	( )	( )
Watchmaker	( )	( )	( )
Electrician	( )	( )	( )

can be expressed as attitude items

	Agree	Disagree
Taking alarm clock apart is fun	( )	( )
A watchmaker has very interesting work to do	( )	( )
I could be a success as an electrician	( )	( )

[8] E. Nelson, "Attitudes: 1. Their Nature and Development," *Journal of General Psychology* (1939), **21**, 381.

But the reverse is not true. Such an attitude item as "The benefits of war outweigh its attendant evils" can be judged as true or false but not whether it is liked or not, for there is no specific action implied which the reader is to perform.

The evidence is accumulating that there are definite relations between interests, attitudes, and personality factors pertaining to the adjustments of everyday life. Whether or not group factors will ultimately emerge among them remains to be seen. At the present time there are many classifications, and more are to be expected. We expect that such investigations will eventually give us a better terminology. In the meantime we suspect that many attractive abstractions will be employed for which there are no counterparts in everyday behavior.[9]

Interests are learned.—Since interests involve reactions to specific things, they must all be learned. Accordingly they may be modified later on by re-education. A rat running a maze learns the correct pathway by avoiding punishment and by reaching the goal. Here is a simple illustration of building up a series of positive and negative reactions. We speak of this as learning without any reference to interests, since the rat cannot tell us whether he likes this or that. Among men, who can report their subjective feelings, such reactions are associated with liking and disliking. Young reviews a number of experiments where liking or disliking is acquired.[10] Thorndike concludes:

> The results of our experiments support the conclusion that a person can be taught new attitudes and tastes as surely though not as easily as he can be taught facts or skills. The basic principles of learning by repetition and reward seem to operate with wants, interests, and attitudes as they do with ideas and movements.[11]

Thorndike outlines several methods by which interests may be acquired. In the main these amount to bringing the specific activity into such relation with an already established want or interest that doing the specific activity results in securing satisfaction from the established want. His conclusion is that

[9] See chapter 14 for further consideration of this topic.

[10] P. T. Young, *Motivation of Behavior* (John Wiley & Sons, 1936), pp. 332–37.

[11] E. L. Thorndike, *The Psychology of Wants, Interests and Attitudes* (D. Appleton-Century Co., 1935), p. 189.

a person who has the ability to learn a certain science or art, but has been stopped from doing so by lack of interest, can probably acquire the interest if he wants to acquire it.[12]

In one respect this statement does not claim so very much. If a man has the ability and the want to acquire an interest he has the want and there is nothing remarkable in the fact that interest emerges, since interest is supposed to develop when one is successfully satisfying his wants. In another respect the statement postulates wide latitude in acquiring interests. Activities that can be performed successfully enough to satisfy some want tend to become interesting, at least for the time being.[13] Thus a man may attend church, may show unmistakable interest in church affairs, may even join the church, in order to further his courting of a sweetheart. Sometimes such a developed interest becomes a permanent one; sometimes when he marries the sweetheart the interest acquired in that connection drops out. Interest in dancing and a host of other activities are acquired under similar circumstances.

Thorndike has also postulated in his statement that the person has the ability to perform what is to become interesting. When that is the case, interest should result from utilizing the ability; for the ability should make success possible. If a person desires to learn some parlor trick requiring dexterity of finger movements, he will probably succeed or fail depending upon his ability in this respect. Even with only fair ability he might learn the trick if he needed to do so very badly. But in this case he would not develop an interest in such performances and go on to learn many more, as might another with outstanding dexterity.

When any activity associated with an object enables the individual to satisfy his desire, the activity tends to be liked—thus a new interest is acquired. Tuttle[14] calls this learning "conditioning." Thorndike calls it "learning by the law of effect."

On the other hand, the quotation does not imply that interest will arise when ability and/or want are absent.

[12] E. L. Thorndike, *Adult Interests* (The Macmillan Company, 1935), p. 18.

[13] Some activities that are satisfying means to an end do not become liked because at the same time they prevent other wants from being satisfied. Thus grading papers prevents an instructor from reading a novel, playing tennis, etc.

[14] H. S. Tuttle, "Creating Motives," *Journal of General Psychology* (1940), **23**, 17–29.

We have just said that all interests are learned, acquired. There are some interests, however, that come very close to being native, if they are not actually inherited, such as liking sugar and disliking quinine. But let us disregard these exceptional cases and consider the great majority of interests. These appear only after experience with things, after reacting to objects, including persons. After apparently the same experience, some say they like it and others that they dislike it. Whence comes the difference in response? Apparently the explanation is to be found in the varying capacities of men. Keen eyesight makes it possible for one to perceive differences in birds that the short-sighted man cannot. Only the former can become interested in observing birds; whether or not he becomes a naturalist will depend upon still other factors. The clumsy boy may whittle but will not produce objects that excite enthusiasm, and so he will not practice and perfect himself as another may do.

Woodworth goes so far as to say:

> . . . . human interests keep pace with human capacities. Almost always, where a child displays talent, he also displays interest. It might not be amiss to extend McDougall's conception of the connection of interests and emotions so as to speak of a native interest as the affective side of a native capacity.[15]

Experimentation does not so far, however, support this close connection between interests and capacities.

The evidence is fairly conclusive that occupational-interest patterns are well established in many children by fifteen years of age.[16] The characteristic sex differences in interests are clearly evident at that time.[17] This means that such interest patterns are present before training and experience in the occupation could have caused them. Are these patterns caused by purely environmental factors or by inherited tendencies?[18]

Tuttle is quite emphatic that interests can be learned. He writes:

> . . . . with the growing evidences that interests are educable. Tastes can be directly cultivated. Motives can be created. The possibility of increasing the strength of innate interests and of building up other interests

[15] R. S. Woodworth, *Dynamic Psychology* (Columbia University Press, 1918), p. 74.

[16] See below, p. 271. [17] See below, p. 228.

[18] See below, p. 680, for further consideration of this point.

has been established beyond reasonable doubt. Indeed, it has long been recognized, as witness successful efforts for many generations in cultivating appreciation of the various fine arts.[19]

The writer, on the other hand, wonders how far it is possible to develop a given interest in all people. Can all be led to take an interest in mathematics, art, gardening, sewing, for example? When we witness the tenacity with which many students insist on being artists, lawyers, and so on and, among those who don't know what they want to do, the vigor with which they rebel at suggestions to do this and that, it would appear that the interests of many high school and college students are already well established and vary greatly. Either these interests are expressions of their abilities and therefore of inborn characteristics or else they result from social forces not yet recognized in this connection. If the latter is the case, there is great need for research on the problem; for there are too many students who seemingly lack the interests which characterize their fellows who are well adjusted. If social forces are responsible, it would appear that they reside largely in the home and the elementary school; else we would not have such distinct differences in interests as early as the high school.

INTEREST, ABILITY, ACHIEVEMENT

There is no known way today of directly determining a man's interests or abilities. Both are inferred from what a man says and does and from the use of tests. Consequently when we talk about the relationship between interests and abilities we mean the relationship between observed behavior or between test scores. It is better to talk about relationships between interest and achievement than between interest and ability, because achievement is what is observed and measured, whereas ability in large part is inferred from achievement. In the case of educational tests of spelling or arithmetic or trade tests for carpenter or interior wireman the scores indicate proficiency, which must be attributed to an unknown mixture of various abilities modified by learning.

Indeterminate indicator of success.—We have said that interest in an activity is an indicator that performance has been successful.

[19] H. S. Tuttle, "Emotion as Substitute Response," *Journal of General Psychology* (1940), **22**, 102.

Does not that imply that there is a definite relationship between interest and success? In general the answer is: interest is an indeterminate indicator of success.

There are several reasons why interest is not directly related to achievement. The first is that interest in an activity is an indicator of satisfaction but not necessarily of success. This distinction pertains to my own and someone else's estimate of my attainment. When someone else judges me as successful or not, he is measuring my performance in terms of his own or some concrete standard of proficiency. Success here has reference to ability or proficiency. Thus a certain boy spells as well as the average seventh-grader; he high-jumps 5 feet; he has an IQ of 120. These statements of ability measure his success. Success for me, on the other hand, has reference to what ensues—the outcome, consequence, or termination of my own desires. It is necessarily a very personal matter because my desires are different from those of other people, and they change somewhat from day to day. Success for me is attaining my own personal goal, satisfying my particular combination of desires. Success is an appropriate word to use with reference to someone else's estimate of my behavior; but satisfaction, not success, is the term to use with respect to my own estimate of my performance.

Interests indicate satisfaction. Satisfaction may or may not be related to efficiency or to ability or to success as viewed by another. For example, a girl says she likes badminton. Since she plays regularly, her overt behavior supports her subjective estimate. But she suddenly stops playing, and then we realize that it was a young man she met on the badminton court that really interested her. Having lost interest in him, she ceases to play badminton. Interest in badminton meant satisfaction in meeting him; it did not indicate efficiency in playing badminton.

The desire for social approval is an important ingredient in satisfaction. The more this element is involved, the more it complicates the relation between personal success and proficiency. In playing badminton it is very important that the proper clothes be worn. If they are, satisfaction may be achieved although the playing is indifferent. That a woman plays bridge regularly need not mean she plays well. She must play well enough not to receive disapproval. When she does encounter disapproval, she joins another crowd of

poorer players among whom she again has a good time. Here success is probably measured by the woman in terms of her ability to select proper clothing, to select the right group, and to carry on her share of conversation, rather than to play bridge. All means that bring approval have interest attached to them. Interest indicates success from the standpoint of the person himself; the bystander judging the behavior from his viewpoint may consider the behavior quite otherwise. Interest is therefore an indeterminate indicator of success, as others use the term.

A second reason for indeterminateness is to be found in the fact that an activity may be liked or disliked long after it has ceased to be carried on. When a means has thus been discarded for a better one, liking for the former may shift to indifference or even to disliking. Last year's shirt, that went so well with skiing, may now be disliked: that is readily appreciated. But when a means has been discarded because the goal is no longer sought, we frequently have continued interest in the activity or at least we say we have. Thus our girl who has ceased to play badminton may go on saying for a long time, possibly all her life, that she likes badminton. I like fishing, but I seldom go any more. Saying I like fishing does not guarantee that I go fishing or that I ever was a skillful fisherman. All it means is that on one or more occasions I had a good time while fishing. Expressed liking and disliking do not guarantee that any particular effort will be expended to act accordingly; they merely indicate that once upon a time under certain circumstances the activity brought satisfaction or dissatisfaction.

A third reason for indeterminateness is that interest is often attached to an activity not in terms of its essential characteristic but in terms of some trivial aspect. Interest is like feeling in that it is an over-all reaction easily associated with what is present at the time. Thus a boy says he likes arithmetic when it is really the teacher, the girl in the next seat, or the opportunity to be monitor that he really likes, the significant name for all this being arithmetic. The writer has met a considerable number of students in their second year of graduate law who had always planned to be lawyers, following in the footsteps of their fathers. Having high intelligence, they earned good grades and enjoyed studying law.

But many of these, when they came to know just what a lawyer does day by day, realized that that was not what they wanted to do. Here again interest was attached to the name but not to the essential activities for which the name stands.

Fourth, interests are indeterminate indicators of success because they sometimes but not always indicate success. Since personal satisfaction is dependent part of the time upon successful performance in the eyes of others, it is evident that there must be some relationship between interest and success. Hobbies afford the best example. Continued play leads to increased skill and knowledge. But even here there is no certain guaranty of outstanding ability. Some adult stamp collectors keep their stamps in a slovenly manner and know surprisingly little of the finer points of the activity, being content with acquiring as many stamps as possible. Many a golf enthusiast seldom breaks 90, and some play more poorly than that. Similarly with the girl playing badminton—if the crowd were good players she would have to be skillful also or she would not play with them. But if the young man was no better than she, her poor playing would bring success as far as her goal was concerned. Only when the circumstances are known can any real estimate be made of her ability. In other words, ability must be determined on grounds other than that of expressed interest. The expressed interests furnish clues, however, as to what abilities may be present.

If a list were kept of all the interests expressed by a boy over a considerable period of time, much light would be thrown upon his conceptions of success and, less reliably, upon his abilities. But considerable insight would need to be employed in arriving at any conclusions. Thus, if a boy not only took an alarm clock apart but reassembled the parts so that it would keep time; if upon visiting the jewelry store he said he wanted to be a watchmaker; if after the electrician fixed the wiring in his home, he wanted to be an electrician; if after going to the dentist, he wanted to be a dentist; and so on—we may *guess* that he likes to work with small tools, that he has fine finger co-ordination. We should then not rely upon such a guess but should determine the facts by appropriate ability and performance tests.

Uninformed and intelligent interests.—It is possible for inter-

ests to play a more important role than so far indicated. Interests do not lend themselves to analysis, but the thing to which the interest is attached can be analyzed. An uninformed interest is merely a reaction to the thing as a whole without any particular awareness of the aspect of the thing which arouses liking or disliking. An intelligent interest is one where the activity has been subdivided into its component parts and the person knows that he likes several parts, dislikes possibly certain other parts, and is indifferent to the rest. In such a case the person possesses a battery of interests attached to the several parts with an interest for the sum total in addition. Thus I like teaching as a profession; at the same time, I have likes and dislikes for all the various parts of the vocation. It is this sort of interest that should emerge from a comprehensive study of occupations. Such an interest is an intelligent one and has far more significance than the kind of interest in occupations usually possessed by students.

A twofold hypothesis.—Analogously, the relationships among abilities, interests, and achievements may be likened to a motor boat with a motor and a rudder. The motor (abilities) determines how fast the boat can go, the rudder (interests) determines which way the boat goes. Achievement might be thought of as the distance traveled in a straight line in a given interval of time, resulting from operation of both motor and rudder. This analogy fits in with the conclusion of Wyman:

> Intellectual interest is a very potent factor in determining achievement. But the question arises, must a child be interested in what he is doing in order to achieve success in it, or is it the ability to succeed that gives the interest? In which direction does the causal relation lie? We find that the most successful child is highly intelligent and highly interested. Some children who are not highly interested have succeeded, but they are highly intelligent. Again, some highly intelligent, but not highly interested, have not succeeded; and, finally, some with lower intelligence and not a high degree of success are highly interested. The answer to the question, then, is that a child must be interested to achieve success, the greater the interest and the higher the intelligence, the greater the success—and not that ability to succeed produces the interest.[20]

[20] J. B. Wyman, "Tests of Intellectual, Social, and Activity Interests," chapter xvi of *Genetic Studies of Genius*, Vol. I, by L. M. Terman (Stanford University Press, 1925), p. 480.

The foregoing suggests the twofold hypothesis: First, if a student has sufficient interest to elect a college course, his grade in it will depend far more on his intelligence, industry, and previous preparation than on his interest. Thorndike reports that "lack of intrinsic interest is a handicap" but "the handicap is small." In certain experiments "the superiority of learning the valuable over learning the useless ranges from zero to 75 per cent. It is oftenest at about 20 per cent."[21] Twenty per cent, however, ought to affect school grades and efficiency records in business to a larger degree than is indicated in most studies of the subject.

Second, interest affects the situation in causing the student to elect what he is interested in and to avoid courses in which he is not interested. When a student discovers he has mistakenly elected a course in which he has little interest, he will finish it about as well as other courses but he will not elect further courses of a similar nature. Because of this situation it is difficult to obtain a real measure of the relationship between interest and scholarship, since those with less than a fair amount of interest in the subject seldom take the course at all (or engage in the occupation).

Interests may not correlate to any great degree with achievement over a short period of time and yet may correlate significantly when achievement involves performance over a considerable period of time. This is suggested by our data on dental students and life insurance agents. The explanation may be that those with interests characteristic of an occupation like that occupational environment and those without such interests do not enjoy doing what the occupation requires and tend to go elsewhere. Consequently scores on an occupational interest scale may not correlate with measures of ability but may correlate with measures of adjustment to varied aspects of the occupational environment. In this case the interest scores would foretell occupational turnover rather than superiority-inferiority. (See chapter 19.)

What has just been stated can account for the conclusion of Hubbard that "interests and abilities seem to be independent variables, each one contributing its own quota to the ultimate success."[22]

[21] E. L. Thorndike, *Adult Interests* (The Macmillan Company, 1935), pp. 50, 52.

[22] R. M. Hubbard, "A Measurement of Mechanical Interests," *Pedagogical Seminary and Journal of Genetic Psychology* (1928), **35**, 249.

On such a basis ability explains efficiency on the job, interest explains whether the job is accepted or not.

Interests significant for their own sake.—Abilities and achievements can be best measured by tests especially designed for the purpose. It is possible that interest tests may be included in such batteries of tests—that is still to be established. But whether they can be or not is relatively immaterial. Interests supply something that is not disclosed by ability and achievement. They point to what the individual wants to do, they are reflections of what he considers satisfying. If our objective is happiness and success we must consider both interests and abilities, for surely enjoyment is just as important as efficiency in everyday life. Counseling that considers both abilities and interests is distinctly superior to that based on either alone, for it puts us in a position to estimate both what the man can do and what he wants to do.

THREE CONCEPTIONS OF INTEREST

Interest may be viewed as a single expression, such as "I like arithmetic" or "I am planning to be an engineer." Second, interest may be considered to be a general tendency toward a constellation of items, as when we state that a man has mechanical or scientific interests. Third, interest may be thought of as the total score on an interest inventory, as when he is said to have the interests of an engineer or lawyer or a high masculinity-femininity (MF) score.

Interests as we ordinarily think of them are specific, as already pointed out. Thorndike says:

> First, there is great specialization of interests. Second, such group factors as appear seem more related to characteristics of the situation responded to than to unitary "traits" in the persons. Music, sport, friendly intercourse, and talk, fiction, and drama are certainly more obvious and probably more significant as organizing causes than conscientiousness, pugnacity, love of achievement, curiosity, craving of bodily exercise, and the like.[28]

It is possible, however, to recognize general interests. So long as we consider the items on an interest test singly, we have only specific interests. The same situation holds with respect to attitude

[28] E. L. Thorndike, "The Interests of Adults," *Journal of Educational Psychology* (1935), **26**, 506.

tests. But when scores are based upon an entire interest or attitude test, certain generalizations may result. Thus the masculinity-femininity (MF) interest test discloses the fact that men are interested more than women in mechanical, scientific things and women are interested more than men in linguistic, musical, artistic things. Such terms are summaries of many supposedly similar specific items. Presumably the same is true when one says he likes scientific activities and dislikes musical activities. But most people rebel at such general items as such, saying that when they stop to think they find they like certain examples and dislike others. Seemingly interest remains attached to specific activities.[24] This does not mean that worth-while tests could not be developed, or in fact our own interest test could not be used, to measure interest in mechanical, artistic, or linguistic activities or in daredeviltry and similar aspects of behavior. Scores on such tests would sum up interest for the specific activities judged to represent the type. The question remains, however, does such a score represent a general interest or merely a sum of many related specific interests?

So far we have been able to develop an occupational scale for every specific occupation we have tried. The attempt, on the other hand, to develop a scale for executives in general was not a success.[25] We know now that the interests of different kinds of business executives differ considerably from one another. Apparently there are no interests which characterize "executiveness" as there are interests which are associated with sales manager in contrast to advertising, production, and personnel manager. The interests of teachers in different subject-matter areas also differ appreciably. Apparently there are no interests which go with the two functions of management and teaching.[26]

This book is primarily concerned with the third conception of interests, in which an interest inventory of 400 items is employed

[24] The recent work of McGehee agrees, while that of Wickert supports the existence of general interests, which are related to certain goal-values. See W. McGehee, "Changes in Interests with Changes in Grade Status of Elementary-school Children," *Journal of Educational Psychology* (1941), **32**, 151–56, and F. Wickert, "A Test for Personal Goal-Values," *Journal of Social Psychology* (1940), **11**, 259–74.

[25] E. K. Strong, Jr., "Vocational Guidance of Executives," *Journal of Applied Psychology* (1927), **2**, 331–34.

[26] See below, p. 161.

and the 400 expressed choices are combined into a summary score. Moreover, these expressed likes and dislikes are so weighted that the final score classifies the individual as to whether he belongs to this or that group, usually an occupational group but not necessarily so. Here we discard reliance upon any single expression of interest, knowing that on the whole such expressions are quite unreliable and lacking in permanence, and base our conclusion upon a summary of many interests, each one furnishing some indication of the broad interest trend. The idea is that a student can say whether or not he likes a great variety of specific activities, each answered separately, but he is not competent to summarize all these varied interests and to select an occupation upon the basis of that summary. The scoring system indicates how his interests compare with men in various occupations—the inference being that the congeniality of occupations is roughly proportioned to the number of interests which the student and men in the occupation have in common.

When "vocational interest" is defined not as a single choice but as "the sum total of many interests that bear in any way upon an occupational career," then we find surprising permanence, certainly among adults and college students and to a somewhat lesser degree among high-school students (see chapter 15).

Figure 1 illustrates the first and third conceptions of interest. The data represent attitude toward an item, attitude being defined here as the difference between liking and disliking. Thus at 15 years of age 86 per cent like and 5 per cent dislike hunting, and the attitude score is 81 per cent. Similarly at 55 years the attitude is 30 per cent, based on 51 per cent who like and 21 per cent who dislike hunting. If interest is restricted to the one item best liked,[27] then from Figure 1 we see that 15-year-old men like hunting best of anything and 55-year-old men like "progressive people" best of all the items considered. If we specify interest as the three items most liked, then at 15 they are, hunting, driving an auto, and fishing; and at 55 they are progressive people, musical comedy, and the *National Geographic Magazine.* If we had nothing to go on but information regarding the three chief interests possessed by men

[27] The items in Figure 1 were selected more or less at random but primarily so that the plotted lines would not overlap so much as to be confusing.

at various ages, we should have to decide that interests change radically with age.

If we have more information, such as is given in Figure 1, we

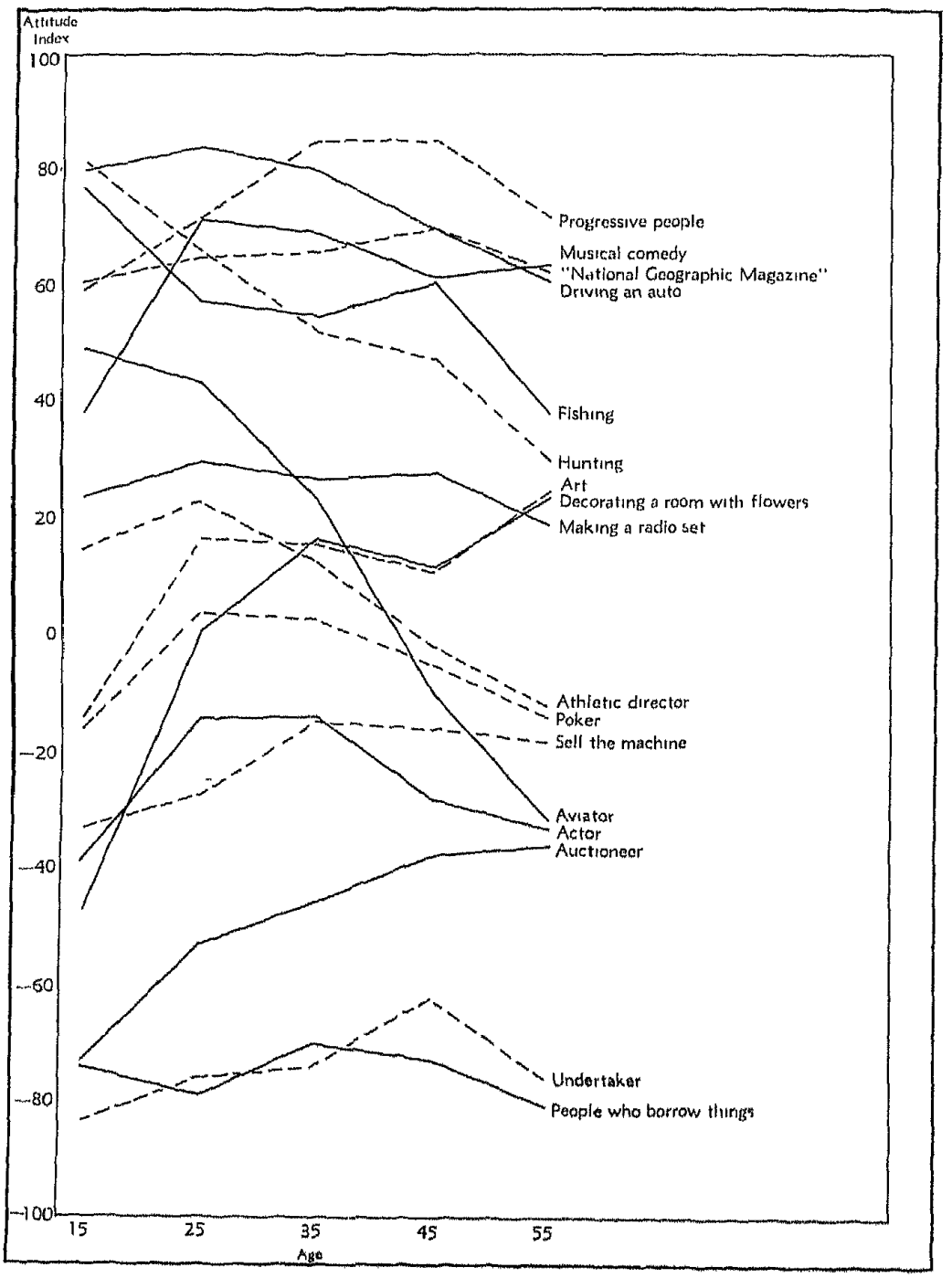


FIG. 1.—Attitudes toward certain items at 15, 25, 35, 45, and 55 years of age.

see that some interests increase and some decrease with age. In some cases the changes are very slight and in other cases the changes are great; but there is no reason to assume that interests alter capriciously, inexplicably. Each interest waxes or wanes in a definite way, moreover, when we realize that an individual has many interests, we can no longer assume that his behavior is determined by any one of them. Even if he has stated on some questionnaire that a certain interest is his strongest, he of course does not mean that it alone dominates his behavior. It is only when the sum total of his interests is taken into account that there can be a good basis for estimating what his behavior will be.

Each individual has many interests of great variety and complexity. At any moment he can be conscious of only one, or at most of a very few, of all his interests. Only these interests may appear to influence him at that time, but all of the remainder do influence him sooner or later and possibly in slight degree without interruption. It is because of this attentional situation that a person changes his mind so frequently, since varying combinations of interests are continually appearing in his consciousness. Guidance based on interests must tap most if not all of the existing trends and valuations and must take all into account if it is to be of genuine worth.

SUMMARY

1. An interest is not a separate psychological entity but merely one of several aspects of behavior. Consequently measurement of one interest is not a complete measurement of a unit of behavior.

2. An interest is an expression of satisfaction but not necessarily of efficiency. Liking golf does not necessarily mean that I play well.

3. Saying one likes a certain thing supplies indefinite information regarding what has been done in the past and what will be done in the future.

4. Knowledge of several hundred likes and dislikes provides a much better basis for estimating what has been done in the past and what will be done in the future.

5. Such estimates can be better made by an experienced counselor than by an amateur, but they can be made still more accurately when based on the statistical analysis of hundreds of cases.

6. Estimates based upon many interests indicate what the person wants to do but only indirectly what he is capable of doing.

7. Although the results of our research indicate that there is some relationship between interests and abilities, it is evident that abilities should be measured directly and not by interest tests.

8. Interest tests supply information not given by ability tests; they indicate what the person wants to do, the general direction he should go in order to obtain enjoyment, satisfaction in life.

Chapter 2. Guidance in Terms of Interests

Although the chief theme is interests, it is well to bear constantly in mind the following slogan which is used by army personnel officers:

Place the Man
in the
Work He [can do / likes] the Best

NEED OF VOCATIONAL GUIDANCE

"Everyone who has counseled students knows that many of them have chosen occupations which cannot possibly be justified in terms of their abilities and other characteristics. Yet thousands of students in professional colleges every year pursue curricula which turn out to be tragic mistakes."[1] Strikingly different as are several of the profiles of professional groups in Figure 2, nevertheless "within each of these professional goal groups there is the widest kind of variability, with many students showing individual patterns of achievement which are completely at variance with the demands of the vocation toward which they are apparently heading."[2]

Carl Snyder thus expresses the problem of guidance:

In a word, the purpose of a real education is "la carrière aux les talents." And the selection of the right person for the right work is equally important to society as a whole, the sole means of utilising to the full its productive capacity. The material benefits from such a system would be immense, but not more important than the rescue of hundreds of thousands of frustrated, disappointed, unhappy lives—impaled upon impossible ambitions of

[1] W. H. Cowley, R. Hoppock, and E. G. Williamson, "Occupational Orientation of College Students" (*American Council on Education*, 1939, Studies Series 6, "Student Personnel Work," Vol. 3, No. 2).

[2] R. E. Eckert, "Realism in Higher Education," *Educational Record* (1938), **19**,

careers for which they have no talent or adaptability. Why should the selection of a vocation be left to chance? Why not a *search* for talent and ability? What a difference it might make—not to thousands—the favored few—but hundreds of thousands, each learning to do something distinctly suited to his capacity.[8]

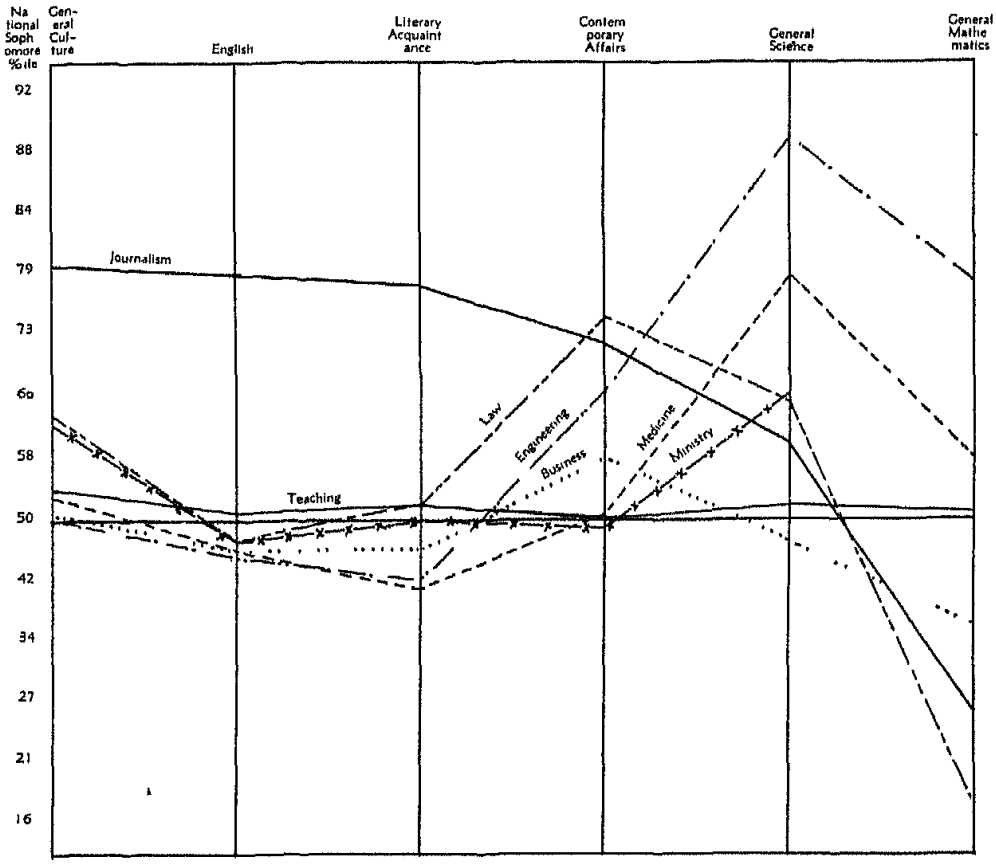


FIG. 2.—Comparison of professional goal groups. (From R. E. Eckert, "Realism in Higher Education," *The Educational Record,* 1938, 19, 102.)

Explanation. Graphs of means on indicated tests of college sophomores who reported their professional goals. The averages are graphed in terms of national college percentiles.

The writer meets many men, thirty years of age and over, who are dissatisfied with their work. Some undoubtedly will succeed no better elsewhere, but others may improve matters by making a

[8] Carl Snyder, *Capitalism the Creator* (The Macmillan Company, 1940), p. 280.

change. Vocational guidance is needed for youth because of its inexperience. It is more successful for youth because of its greater possibilities of choice; but men of all ages have their problems and need help from time to time much as they need a dentist.

There are two views as to where the emphasis should be put in counseling—should it be educational or vocational? These two views are not necessarily related to the two questions: is the student doing well in school? and will he do well afterward? But too often the emphasis is put upon educational guidance because the instructors are primarily concerned with what takes place in school. Too often the attitude is: we give good courses of instruction; it is up to the student to get the good things if he can or will; what he does with them afterward is his responsibility alone. It must not be overlooked, however, that many instructors give much of their time advising students individually regarding both their school work and their future career.

Crawford has recently written: "It is my hunch that proper educational guidance is more important and more meaningful, so far as cultivation of the individual's highest powers are concerned, than is vocational guidance."[4] His argument seems to be that many able men can enter accounting, banking, law, or the steel business about equally well and so can delay their decision until the senior year of college. But if one makes the wrong decision early in college and selects chemistry instead of history, he is badly handicapped in changing his career at the end of his senior year; frequently he will not even attempt to do so.

The writer's hunch on the contrary is that vocational guidance ought to be more stressed than educational guidance. There is very little difference between the two points of view for students in professional schools: the engineering student looks forward to being an engineer, the student in an agricultural school expects to earn a living in some way related to farming, etc. Consequently the relative merit of the two views depends largely upon their usefulness with students who have not entered a specialized course. In the first place, it has always appeared to the writer that a vocation is a more meaningful concept to a student than a college major.

[4] A. B. Crawford, "Aptitude Testing in Personnel Procedure," *American Association of College Registrars, Proceedings* (1934), p. 307.

The latter is viewed as a temporary means to some end, whereas the vocation is a permanent occupation after graduation. In the second place, the vocation is something outside and beyond the college walls in terms of which to orient oneself, whereas the college major is what a faculty has set up for him to study. The student who has a vocational goal chooses the courses for his major with an eye to a more definite objective than the student who has only an educational major to complete. In the third place, it is the vocation actually pursued that determines the significance of the courses taken in college. Selection of chemistry instead of history as a man's college major is unfortunate for the man and for society only if he might have become a far better history professor than a chemist. For that large minority who don't know what they are going to do after graduation educational guidance is easier than vocational; they are compelled to major somewhere. But although they fulfill the requirements (so often with only a very few quality points to the good), that doesn't mean that the educational guidance was a real success. The only real solution for all students is guidance which leads to the development of a goal which will lead them on enthusiastically to do something worth while in life.

SELECTION OF A VOCATION BY STUDENTS

As an actual fact, selection of a future vocation is a real problem for all students, although many do not give it the serious consideration it deserves. We may ask in this connection: what is the basis for such choice? to what extent do young people make a vocational choice? to what extent are they free to enter occupations of their choice? what requirements must be faced?

Interest—the basis of choice.—Any attempt to ascertain why a person does anything is fraught with difficulties. Apparently studies relative to why students choose occupations are no exception. Without making any effort to solve this problem, we can say at least that when students are asked the question, "Why did you choose this occupation?" the most commonly reported answer is, "I like it." For example, in Katz and Allport's study of Syracuse students,[5] where they were instructed to check three of the listed

[5] D. Katz and F. H. Allport, *Students' Attitudes* (Craftsman Press, Syracuse, N.Y., 1931), p. 110.

reasons and did so, 82 per cent reported "liking for particular work," 45 per cent mentioned "special abilities," and eighteen other reasons were checked by 30 per cent or less.

Extent of vocational choice.—The published data on this subject are conflicting. For example, only 16.9 per cent of high-school graduates entering the University of Wisconsin reported no occupational choice,[6] while in the same year the percentage was 36.9 at the University of Minnesota.[7] Twenty-four per cent of college students at Syracuse University expressed no choice, but about one-third of the remainder gave two or more choices, indicating they had not yet reached a definite decision.[8] Twenty-four per cent of Stanford seniors gave no occupational choice a short time before graduation and 12 per cent stated an occupation but with such qualifications as to indicate they were not sure. This made a total of 36 per cent who were not sure what they were going to do after graduation. Nine months later 9 per cent gave no occupational preference and 16 per cent were not sure of their expressed choice.[9] Subsequent follow-ups show that some have not engaged in the occupations which they originally stated they were sure they would enter.

Extent of choice is dependent upon many factors. If students are required to express a choice before registration, practically all will oblige the authorities. If there is nothing at stake, a considerable minority will give no choice. More can state the general field they propose to enter than can name the specific occupation within the field. Evidently some students confuse choice of occupation with choice of company to work for, so that until they have actually secured a position they say they are "not sure." From our experience this is rather characteristic of students planning to enter business and in our opinion explains to some extent the fact that a

[6] V. A. C. Henman and F. O. Holt, *A Report of the Administration of Scholastic Aptitude Tests to 34,000 High School Seniors in Wisconsin in 1929 and 1930* (Bulletin of the University of Wisconsin, Serial No. 1786, General Series No. 1570, June, 1931), p. 37.

[7] E. J. Williamson and J. G. Darley, "Trends in the Occupational Choices of High-School Seniors," *Journal of Applied Psychology* (1935), **19**, 363.

[8] D. Katz and F. H. Allport, *op. cit.* (1931), p. 117.

[9] E. K. Strong, Jr., "Diagnostic Value of the Vocational Interest Test," *Educational Record* (1929), **10**, 66.

smaller percentage of business students express definite choices than is the case with students headed for the professions. "Saving one's face" is also a factor. Saying one is going to be a lawyer receives popular approval but not that one is going to be a grocer. Our studies indicate that college graduates who have entered a lower-level occupation usually do not admit, even five years after graduation, that such is their choice. It is consequently evident that that some "Don't know" responses are given in order to cover up a program which receives no social approval from one's classmates. Anyone who has ever tried to place students in jobs knows that most openings are uninteresting to any given student. It is evident that many students who "don't know" have strongly held negative choices, even if they lack positive ones.

Aside from the variation in numerical measures of extent of choice of a vocation there is the variation in significance to be attached to a student's declaration. These must range all the way from a well-determined life career to mere guesses. It is therefore futile on the basis of existing data to attempt any precise estimate of how many students have really selected a vocation at any given age. We can be sure, however, that far too many are undecided.

Freedom of choice.—At least a third to a half of college students are not free to choose occupations as they please. Williamson says about 37 per cent of college men and 46 per cent of college women do not give the same occupation as both their chosen and their preferred vocation.[10] The distinction between choice and preference should receive more consideration. What are the factors that cause choice to differ from preference? A number may be mentioned: (1) pressure of family or friends of family to enter a given vocation, to live near mother, etc.; (2) desire to marry, which handicaps further preparation for the preferred occupation; (3) an opportunity to become immediately established; (4) lack of necessary finances to finish education; (5) lack of necessary ability; (6) lack of necessary personality; (7) lack of requisite health; (8) lack of information about preferred and competing occupations so that adequate plans cannot be formulated.

Validity of expressed choice.—Expressed choice for a vocation

[10] E. G. Williamson, *How to Counsel Students* (McGraw-Hill Book Co., 1939), p. 428.

cannot be accepted as proof that that is the occupation the student should enter. One example of how inadequate expressed choice is appears in the data of Stuit.[11] Of 94 women in a teachers' college only 10 obtained an A or B+ rating in teacher interest on the *Vocational Interest Blank*. "It is quite apparent that all Teachers College freshmen do not look upon teaching as their life work. Both the Strong Inventory and the students' own statements substantiate this conclusion. The majority of the young women are primarily interested in marriage and a home." Yet they have seemingly indicated interest in teaching by their actual attendance in a teacher-training institution! Another study from the same institution correlated 17 occupational-interest scores of 141 freshman women with their self-estimated vocational preferences. Bedell reports that

> in general self-estimates predict scores for the given occupation no more accurately than such estimates predict the scores for some other occupation. . . . . Increased support [is given] to personnel workers who insist that students' self-estimated vocational interests are insufficient evidence upon which to diagnose the amount of satisfaction that will be obtained in a vocation. . . . . A grave question is raised toward the validity of educational procedures largely based upon the self-estimated interests of students.[12]

Expressed choice must be replaced by carefully considered measures of the individual's abilities and interests.

Williamson and Darley report the vocational choices of nearly nine thousand high-school seniors in the years 1929 to 1933 inclusive. The data indicate that "concentration of choices in a few traditional categories continues to exist, in spite of the fact that such concentration is not in agreement with known facts about corresponding distributions of abilities, interests, and opportunities."[13] Uninformed interests must be replaced by intelligent interests, as pointed out in the preceding chapter; else many students will be forced to readjust themselves to their proper socio-economic level.[14]

[11] D. B. Stuit, "A Study of the Vocational Interests of a Group of Teachers College Freshmen," *Journal of Applied Psychology* (1938), **22**, 532–33.

[12] R. Bedell, "The Relationship between Self-estimated and Measured Vocational Interests," *Journal of Applied Psychology* (1941), **25**, 64–65.

[13] E. G. Williamson and J. G. Darley, "Trends in the Occupational Choices of High-School Seniors," *Journal of Applied Psychology* (1935), **19**, 369.

[14] See chapter 15 for further discussion of this topic.

SEVERAL HURDLES TO JUMP

Success in any pursuit calls for the possession of a number of traits. Age, ability, interest, character, and economic necessity are all factors which seemingly affect success, say, in the life insurance business. Too young and too old men do not produce as well as middle-aged men. Ability of some sort is needed, although we have no definite measure of it today. Interest is also a factor. Dishonesty and drunkenness explain why several men rated A in interest have failed. Discharge sometimes results if the man "does not fit into the agency," for he undermines the morale of the group.

In a hurdle race one must clear so many hurdles to win. Similarly here one must meet the minimum requirements for all the needed traits. Sometimes possession of an excess in one quality will compensate for lack of another trait, but in the main so much of each requirement is essential. Too little interest will seldom be offset by more than enough intelligence, and vice versa. Possessing the necessary interests will not offset marrying a wealthy widow, for selling insurance is hard work and few men who do not need to earn a living will exert themselves that much. Drunkenness will ruin a career even if all other necessary traits are present. Figuratively, an applicant must jump all the hurdles or he will not finish the race.

It cannot be emphasized too much that interests are not alone sufficient to determine occupational fitness. If there are but six hurdles to jump, each completely independent of the others, and the six combined correlate 1.00 with the criterion, each will correlate .408 with the criterion. If, however, the six are not completely independent but correlate .20 with each other, then each will correlate .577 with the criterion.[15] Since we are in no position even to guess how many traits determine success in this or any other occupation nor the extent to which such traits correlate with one another, it is futile to surmise the size of the possible correlation between interest, or any other factor, and an occupational criterion. It is worth while to realize, however, that if the number of traits is fairly large and the traits themselves are approximately independ-

[15] T. L. Kelley, *Statistical Method* (The Macmillan Company, 1924), Formula 151, p. 200.

ent of each other, the correlation between any one trait and the criterion will not be high. It is important to bear this in mind, since too many judge the value of a test in terms of the size of the correlation between scores on it and the criterion. The size of the correlation is a reflection of how many factors are involved and their degree of independence. A perfect test may yield a low correlation with the criterion merely because it measures only one hurdle among many that must be jumped.

Requirements that must be faced.—Several reasons were given above why some students enter an occupation other than their professed choice. Four of these are factors that should be considered by all persons in making a decision, for otherwise the decision may be based upon inadequate information.

a) Necessary knowledge: Before entering an occupation a man should have gained sufficient information about it to understand its component parts. Knowing only one aspect of it is not enough, for that one may be entrancing but other parts may be utterly boring. A man should determine whether or not he would care for most of the activities involved in the vocation. There is probably no job that carries with it no unpleasant features. So the problem is really to ascertain if the major factors of the job will bring enough satisfaction to compensate for the unpleasantnesses. In addition, other possible occupations should be similarly analyzed to make sure that the chosen occupation is really more attractive. This is seldom done by students, one reason being man's reluctance to think unless he absolutely has to, and the second reason being that students are seldom confronted in our educational institutions with information about how people earn a living, so that they have had no training in how to analyze the various vocational opportunities that appeal to them.

Imagination is needed here as well as cold-blooded analysis. The invention of the automobile has given millions of people jobs that did not previously exist. No one can really foresee all the new jobs that may develop in the fields of radio, airplanes, air-conditioning, frozen fruits, plastics, rayon, television, etc. Every invention has wonderful possibilities for those with imagination.

b) Necessary ability: Several studies have shown that many students wish to enter vocations calling for greater abilities than

they possess. Such programs are doomed from the start. The sooner the student can be diverted into another channel the better for all. Too often the boy and his family insist on going ahead. Often after the boy has failed the family still insist, refusing to face the fact of lack of ability and berating the son for lack of industry.

Necessary ability may be determined by intelligence and aptitude tests where such are available. Scholastic performance and achievement tests are real aids wherever definite courses of study are prerequisite to the career, as in law, engineering, medicine, and other fields. Ability to perform the simpler aspects of a vocation, as often pursued by part-time students in school or during vacation, may or may not test the abilities which are required in the full-time position; usually they do not.

c) Necessary personality: Most of our so-called personality tests are of little value today because no one knows what personality traits are required in most vocations. Popular opinion holds that salesmen are loud mouths who push in where angels fear to tread. Ergo, all salesmen are extroverts of dominant personality, etc. There is altogether too much of this sort of thinking. The writer is here condemning not these tests but the lack of scientific knowledge of what scores on these tests mean vocationally speaking.

In the meantime a common-sense approach is useful. Can this young woman, who wants to be a nurse, keep on her feet all day, doing a great deal of unpleasant drudgery? Can she be patient with sick people, many of whom find fault all the time? And can she submit without strain to the strict discipline of a hospital? Questions like these, based on the job requirements, should be faced by candidates for all jobs.

In addition, there are the requirements of good character. Few employers can use an employee who is not honest, who gets drunk on the job, who uses drugs or gambles to excess. Possession of such traits, even when they do not interfere with the daily work, causes the possessor to be marked for nonpromotion.

d) Necessary physique: Gowin pointed out years ago that executives are taller and weigh more than the average. But this does not mean that short, light-built men cannot become executives, for there are plenty of such men in prominent positions. Important as physique would seem to be, the writer doubts if we really under-

stand the physical requirements of most vocations sufficiently well to know how to advise others. Ever since the writer met a successful salesman who stuttered so badly he could not pronounce his own name in less than a minute, he has hesitated about setting up physical requirements. This particular salesman, it should be added, used a series of pictures, diagrams, and neatly lettered cards, which told his story effectively and in a novel manner. The writer's guess is that if a man really wants to do something he will probably find a way of doing it despite physical handicaps that to others appear insurmountable. But, where there is no will to achieve, men should be discouraged from attempting tasks for which they are not physically built.

The profile.—When prediction is based upon correlations and similar measures as to how performance in one respect is associated with performance in another, it is possible to predict what will happen to one hundred individuals; but it is quite another matter to predict what one person will do. Allport has very neatly expressed the point: "if seven in ten Americans go to the movies each week, it does not follow that I have seven in ten chances of attending."[16] My chances of going must be determined from *my* attitudes, interests, environmental circumstances. Prediction based on any one factor will be quite faulty; only when all factors are considered can prediction be fairly correct.

The best procedure to meet this situation is the presentation of all measures of an individual in a profile. The ideal procedure is to express the scores on all tests and ratings in the form of percentiles, or better still in standard scores, so that all measurements may be directly compared. Norms for a profile are obtained by testing men who are acceptably performing the work in the occupation and by plotting the means of such scores in profile form. The profile of the candidate may then be compared with the standard profiles of various occupations to see with which occupation his profile agrees best. Examples of such profiles involving occupational-interest scores, measures of scholarship, and personality-test scores are given in chapters 17 and 18.

The profile fits into the conception of a "hurdle race" especially

[16] G. W. Allport, "The Psychologist's Frame of Reference," *Psychological Bulletin* (1940), **37**, 17.

well. From the candidate's profile one can see if he possesses those characteristics which are essential for this school major or that occupation. A single measure, whether from one test or a battery of tests through multiple correlation, does not supply the wealth of information that may be obtained from a good profile.

Which way to go?—To predict the best possible adjustment to life it is necessary to know:

1. Which way is the man headed? Which way should he be headed?
2. How far can he go?
3. How far will he go?

How far he can go is dependent primarily upon his various abilities, his potentialities. How far he will go is dependent primarily upon his motivation both today and tomorrow. We are not greatly concerned in this text with these two problems—they must be left to others more concerned with measuring ability and motivation. We are, however, greatly concerned with the direction in which the man is now headed and the direction in which he is best fitted to go. Although we believe measurement of man's interests is the best basis today for answering the question "Which direction?" yet it must always be borne in mind that abilities must also be considered. The best direction is the one in which his abilities and interests may both be used to best advantage.

The diagrams in chapter 8, depicting occupations upon the surface of a sphere, are most useful in this connection. When a young man or woman is first interviewed by a counselor, the young person is unknown and is best thought of as occupying a position at the center of the sphere. The first question to decide is in which general direction he should go. To answer this question should be the objective of the interview and testing. The writer believes that determination of the *general* direction is about as far as the high-school counselor should attempt to go. A more precise goal can be better determined after some college work has given the student further basis for estimating his abilities in different directions. The student who does not go to college can very well spend a year or two trying out various possibilities before attempting to define his precise goal. A certain amount of trial and error, providing it is in the right gen-

eral direction, is usually valuable and is apparently inevitable for most of us.

DIFFERENTIAL PREDICTION OF SUCCESS

The law of supply and demand applies to the qualifications of man as well as to commodities. No one wants to listen to a man who plays a piano only as well as the average man. It is only when he excels most people that his playing is in demand. It is not how much a man possesses of goods or psychological traits that is important but how much more he has than other people that determines his economic value.

In guidance and selection the important points to note are those qualifications of man that distinguish him from others. In what is he superior to most people? also, in what is he inferior to the great majority? His superior qualifications indicate the direction he should go; his strikingly inferior characteristics similarly indicate the way he should not travel. Consideration of both is vital. As a matter of fact his strikingly inferior characteristics are more significant than his superior traits for the reason that what a man cannot do he can't do, but what he is capable of he may or may not do.

There are seemingly two theories as to what is a good education. The first supposes that all should be given the same course of study. So we have in many educational systems very few options until the junior year in college. And many colleges insist on a broad program for four years to be followed by graduate work in some special field. The theory underlying all this is that all are very much alike and need the same dosage of instruction, presumably so that all will remain as alike as possible.

The second educational theory is based upon the doctrine of individual differences. It is representative of the personnel point of view which emphasizes the person as the unit for consideration. It disdains mass production in education as it looks with disfavor upon handling men in the mass in industry. The advocates of this view look for differences in men because it is the differences that lead to personalization of men. Data, such as in Figure 2, support this view. Students planning to be engineers average very high in general science and mathematics and below average in English; students planning to be journalists, on the other hand, average very

high in English, slightly above average in general science, and very low in mathematics.

What are needed to make this second educational theory effective are good measuring-sticks by which students can be differentiated. Achievement tests do this to a degree after the student has taken the required courses. But far too often they are employed merely to flunk students instead of being used by counselors to redirect students into pathways along which they can travel more successfully. Aptitude and interest tests should be more useful than achievement tests, since they can be employed before and not after the course has been taken. Progress is being made in this direction, but much remains to be done before effective counseling is possible. Only when such direction is a reality can education really be personalized.

HOW INTERESTS ARE MEASURED

Interests are subjective experiences. The most direct way to measure them is to have the individual report his likes and dislikes. But because a person's subjective feelings cannot be experienced by another there is no way to check them. Consequently many investigators look upon such records with suspicion and have attempted to substitute procedures of a more objective sort.

Objective tests of interests.—Fryer[17] lists four objective procedures for measuring interests: (1) the information test, (2) the free-association test, (3) the learning test of Burtt, and (4) the distraction test of Burtt.

a) Information test: The information test is the most widely used of all the objective measures of interest. The assumption is that if one is interested in a certain field he will pick up more information about it than the average person. Hence testing the amount of an individual's information should measure his interest in the field. The questions used should cover a wide range within the field and should avoid, on the one hand, information that can be picked up by casual observation and, on the other hand, information that would be secured only by systematic study. The evi-

[17] For a general discussion of this topic, see D. Fryer, *The Measurement of Interests* (Henry Holt & Co., 1931).

dence to date is that the information test is a measure of ability and not interest.

The recent study of Greene and Osborne[17a] supports previous findings, i.e., neither pre- nor post-knowledge of the various topics of a college course is associated with expressed interest in these topics before or after taking the course. Nor were changes in interest ratings predictive of changes in achievement-test scores. Furthermore, no association is reported between intelligence and either the interest or the importance attached by students to the particular problems.

Two recent objective-information interest tests are worthy of mention. The first is the *Co-operative Contemporary Affairs Test* of the American Council on Education.[18] In the form for college students there are 300 items "divided into six sections representing political events, social and economic events, science and medicine, literature, fine arts and amusements. The items are of the multiple-choice form and on the whole require only superficial information." Published results[18a] indicate students majoring in different subjects and also students preparing for different occupations have different profiles when their scores on the six sections are considered separately. Such profiles apparently are related to profiles obtained by the *Vocational Interest Blank;* for men rated A on the physician interest scale, for example, "show a profile very similar to that of those reporting medicine as their professional goal—high in science and medicine and low in everything else." Men rated C on the same scale show a profile approximating mean scores for the general population in all six sections.

The second information test is that of Super and Roper.[19] Instead of measuring information picked up during the course of many years, they present "an adequate idea" of an occupation

[17a] J. E. Greene and R. T. Osborne, "The Relation of 'Student Interest' and 'Student Need' in Educational Psychology to Other Variables," *Journal of Genetic Psychology* (1941), **58**, 211–17.

[18] A. C. Eurich, E. C. Wilson, and E. A. Krug, *Co-operative Contemporary Affairs Test for College Students*, Co-operative Test Service, New York City.

[18a] "Measuring Interests," *Advisory Science Bulletin No. 4* (1940) of the Co-operative Test Service of the American Council on Education.

[19] D. E. Super and S. A. Roper, "An Objective Technique for Testing Vocational Interests," *Journal of Applied Psychology*, 1941, **25**, 487–98.

through pictures on the screen and then measure how much information has been retained. The theory is the same as for the conventional information test, i.e., that those interested in the occupation will remember more than the noninterested. Both on this test and Strong's interest scale for nurses, nurses scored highest, student-nurses scored second highest, and non-nurses scored much lower; the differentiation between the three groups was greater on the picture test. Too few cases were employed, however, to establish the relationship as final. The authors suggest "that, whereas Strong's Blank measures similarity of interests to those of persons engaged in an occupation, the *Test of Interest in Nursing* measures the degree of interest in that occupation, and that the two are not the same" (correlation of zero).

b) Free-association interest test: This type of interest measurement was developed by Wyman and Terman and is considered by us on page 530, below. Wyman's results suggest that there is a factor of intellectual interests separate from intelligence but that there is little evidence for social and activity interests as such. Fryer concludes: "To date, the free association test offers the most promising objective method of interest measurement."[10a]

Burtt has suggested two additional objective procedures for testing interests. The first is based on the assumption that we learn better with pleasant feeling or interest than with the reverse type of feeling or interest. The second is based on the assumption that one is less likely to be distracted when interested. But the resulting data suggest that his learning test is more a measure of ability than of interest and that his distraction test is more a measure of motivation than of interest.[20]

Subjective tests of interests.—Four procedures may be recognized which rely upon the person's own statement of his interests: namely, (1) first choice, (2) rank-order or preference, (3) rating scale, and (4) inventory.

First choice has been the most extensively used subjective method

[10a] D. Fryer, *op. cit.*, p. 307.

[20] H. E. Burtt, "Measuring Interest Objectively," *School and Society* (1923), **17**, 444–48; H. E. Burtt and F. W. Ives, "Vocational Tests for Agricultural Engineers," *Journal of Applied Psychology* (1923), **7**, 178–87. See also G. M. Gilbert, "The New Status of Experimental Studies on the Relationship of Feeling to Memory," *Psychological Bulletin* (1938), **35**, 26–35.

of studying interests. Here the individual records the school subject he likes best or the occupation he prefers. A portion of the literature is reviewed in chapter 20. Considerable information has been obtained by this method. But the reliability and the permanence of such interests are too low to employ them for diagnostic purposes.

A companion procedure is to have items ranked in order of preference or to have all the items checked that are liked. In either case a preference list may be obtained. A large amount of information has been obtained in this way which contributes to our knowledge of human behavior. Such preference lists can be obtained in other ways that should appeal especially to those who want objective tests. Thus librarians supply us with the "ten best sellers" and registrars could supply us with the "ten most popular courses." Very extensive information can be obtained as to what people like and dislike, in which the effect of factors such as sex, age, school grade, locality, etc., can be considered.

A rating-scale technique is also used in which the individual rates himself or is rated by others respecting his interests. This procedure has been used for measuring (*a*) what interests are possessed and (*b*) to what degree a particular interest is possessed.

Thorndike has asked his subjects to evaluate certain interests in terms of how much money they would demand to do certain unpleasant tasks. Measurements in terms of time, pain, and effort have been similarly made. Since all of these judgments have been estimates and have not involved actual receipts of money, actual expenditures of time and effort, or the actual suffering of pain, it is a question whether or not they give any better measurements of intensity of interest than is secured by a straightforward rating scale.

Thorndike has also measured intensity of interests by having activities rated on a scale, say from —5 to 5, where —5 means "extremely unpleasant; comparable to having a dentist work on my teeth, to a bad headache, or to being made a fool of in public," and where 5 means "as much liked as almost anything I can think of." Using such a procedure Thorndike had adults record such ratings for their degree of like or dislike for a list of activities at age 20 to 29, then for ages 30 to 39, 40 to 49, 50 to 59, and 60 to

69, but not for an age range beyond their present age. He says that

> the decrease in the general mass or volume of interest is so slight that plans for adult education may disregard it . . . . The decrease in the total volume of interest from the twenties to the fifties is thus slight, and is restricted largely to physical activities. The interests most needed to support adult learning show no decrease. In them there is no steady, unavoidable decline, not even a drop of one per cent a year, such as is found for the ability to learn.

He concludes:

> If then a person finds himself prevented by lack of interest from learning something which he ought to learn, the lack will almost always be in the way his interests are directed, not in their total quantity.[21]

Although these results are in general harmony with our own findings regarding changes in interests, not intensity of interests, they cannot be accepted as conclusive, based as they are upon retrospection.[22]

INTEREST INVENTORY

The inventory procedure is the method of testing interests that concerns us in this text. Three different uses of this procedure may be noted: first, where the checked items are themselves considered as an aid in personal counseling; second, where summaries are obtained as to what items are liked by whom, etc.; and, third, where scores are calculated from all the items on the given blank.

Miner, one of the pioneers in this field, developed the *Analysis of Vocational Tendencies* blank while at Carnegie Institute of Technology during and immediately after the war of 1914–1918. No attempt was made at that time to score the blank, but the checked items were used directly by the student and his counselor in discovering his vocational interests.[23] The *Occupational Orientation Inquiry* by Wallar and Pressey is a more recent inventory used for

[21] E. L. Thorndike, *Adult Interests* (The Macmillan Company, 1935), pp. 8, 12, 15.

[22] His earlier findings regarding the relationship of interests and abilities based upon memory are not in agreement with later studies by others; see p. 514, below.

[23] J. B. Miner, "An Aid to Analysis of Vocational Interests," *Journal of Educational Research* (1922), **5**, 311–23; "An Analysis of Vocational Interests," *School Review* (1925), **33**, 744–54. In 1922 the blank was called "Analysis of Work Interests."

the same purpose.[24] Here the student checks a list of 225 occupations regarding his knowledge, interest, ability, and opportunity for placement in each job. Shellow reports how she has made use of the *Vocational Interest Blank* in similar fashion in the industrial field.[25] There are many blanks used for this purpose, frequently called "Aids to Interviewing" and the like, which list not only interests to be checked but ask questions regarding the entire career of the individual.

The second use of an interest inventory is essentially the same as listed above under the heading of "rank-order procedure." In both cases the data are manipulated to show that certain persons like this item, or class of items, better than another item, or class of items. Chapters 11 and 12 present considerable data of this sort respecting the contrasting interests of men and women and of 15-year-old and 25-year-old men.

Our primary concern has been, however, to score an entire blank in order to summarize all the information on it and to provide measures that can be employed diagnostically.

Scoring an inventory.—How can expressed likes, indifferences, and dislikes be summarized? Most tests measure how much of a trait is possessed, as height, intelligence, introversion, and the like. There have been attempts to count the number of items which are liked on an inventory; but the writer does not recall any significant results obtained in this way. It does not seem plausible that liking fifty miscellaneous items, such as horses, chickens, going to the movies, arranging flowers in the home, etc., would indicate in any worth-while sense superiority over liking a fewer number of items.

Since there are obviously no right and wrong answers to specific interest items, as is true with most tests, the first step in setting up a scoring system is to establish right and wrong answers on some basis. Two general approaches to this may be recognized. In the first case, the experimenter may decide to investigate intellectual, social, and activity interests, as Wyman did; or he may concern

[24] G. A. Wallar, "The Occupational Orientation Inquiry," *School and Society* (1937), **46**, 507–10; "Use of the Occupational Orientation Inquiry," *Occupations* (1939), **18**, 1–4; and "A Practical Aid to Occupational Orientation," *Journal of Applied Psychology* (1941), **25**, 535–37.

[25] S. M. Shellow, "Vocational Interest Blank as an Aid to Interviewing," *Personnel Journal* (1931), **9**, 379–84.

himself with mechanical and social interests or with interest in people versus things, etc. The items may be classed as typical or not of the given category, and persons may be scored as to the number of typical items they like minus the number of nontypical items they like. Or the persons tested may be classified into two groups according as they have or do not have a given interest, and comparison may be made as to the items the two groups like and dislike. For example, items expressive of daredeviltry are liked less and less as men grow older (see below, p. 301) and so the total number of such items that are liked could be used as a rough measure of youth. The possibilities of scoring in this manner have not yet been thoroughly investigated.

The easiest and most natural way to score an interest blank is to weight the items according as they differentiate between the interests of two groups. Because interests have been customarily scored in this way, the measurement of interests has been usually associated with group differences. Lawyers have been differentiated from accountants, ministers, and the like, men from women, 15-year-olds from older men, etc.

When individuals are scored on interest scales they are classified as belonging to this or that group. Thus the interest items are weighted on the MF interest scale, so that the higher the score the more the individual's interests agree with the interests of the average man as contrasted with the average woman. Similarly, the higher the score on any occupational-interest scale, the more the individual's interests agree with the interests of the men in that occupation as contrasted with men in general.

The procedure provides worth-while objective criteria. Where a test measures amount possessed of a trait it is often difficult or today impossible to obtain an objective criterion against which to check the test scores. How measure objectively the amount of interest or ability possessed by ministers, lawyers, and accountants? But with differential scoring the criterion can be the pattern of interests of ministers, lawyers, or accountants, and a good sampling of these groups will provide such a pattern. It must be realized that such criteria do not express amount of the quality but merely the average pattern of the occupation. Any group referred to in interest testing always means the average of a particular sample. When

the sampling is good, the group may be considered to mean the average of all people who belong to the group. But this extension to all members of the group is always an assumption to be defended by proof of adequate sampling.

Differential scores must be evaluated just as much as scores of amount. Until the range of scores of accountants and men in other occupations on the accountant scale are known, the raw scores lack definite meaning.

Occupational-interest scores are customarily determined by contrasting the interests of the men in that occupation with a men-in-general group. The underlying philosophy of this procedure is that interests which are common to all are of little economic significance, as has been pointed out above. Consequently the interests which are significant for men in a given occupation are the interests which set that occupation apart from the general run of men. These are differential interests. One of the great contributions of the interest test has been its emphasis upon differential interests.

In scoring an individual's interest blank on an occupational scale one is measuring how much his interest profile differs from the profile of the average man in the same way that the occupation differs from men-in-general. Vocational guidance has often been expressed as involving three steps: first, determination of job requirements; second, determination of the man's qualifications; and, third, estimation whether or not the man's qualifications fit the job requirements. The occupational score on an interest test accomplishes these three steps automatically. The scale itself expresses how the occupation differs from men-in-general. The man's score on the scale expresses how well his interests agree with the differential interests of the occupation.

Chapter 3. Some General Conclusions

Some of the general conclusions regarding interests are given in this chapter. The material is presented here rather than in the final chapter because the author himself likes to secure an over-all view of a subject before considering the details.

SIMILARITY OF INTERESTS

Because research regarding interests has been so largely concerned with group differences, it has not been realized that likenesses among the interests of individuals are far more striking than differences. All groups so far studied agree very well in their interests. Men regardless of age and economic or occupational status agree on all types of items to a high degree. There is also good agreement between the interests of men and those of women of corresponding ages. Only when differences in age and sex are both involved do we find correlations approximating zero for certain groups of items. The least similarity of interests occurs between 15-year-old boys and adult women; even here the correlation is .48 when all items on the interest inventory are considered. See chapter 6.

When interest scales are developed expressing the differences in interests of two groups, it sometimes happens that there is complete overlapping between 85 per cent of the two groups upon a given item and the weight for that item is based on as few as 15 per cent of the two populations. It is because of this situation that far larger samplings are needed for valid interest scales than was first recognized.[1] Many of the early studies must be disregarded on this basis alone.

Data are given on page 618, below, to show that occupational groups can be differentiated by using scales based on all the items

[1] See page 637, below.

instead of on only the differentiating items. But naturally the differentiation is not as well achieved by the former procedure as by the latter. As pointed out above, it is the way in which a man differs from his fellows that determines wherein his best usefulness lies. Consequently in tests for guidance purposes the differences must be stressed.

DIFFERENTIATION OF OCCUPATIONS

There are two major considerations in interest testing. The first concerns the differentiation of groups from one another. The second involves the assignment of individuals to membership in one or more groups on the basis of the interest scores. There are consequently two measures of the validity of an interest test. The first is how well the test differentiates occupations; the second is how well individuals are assigned to occupations (or other groups) in which they succeed at least passably and at the same time find the work interesting. Interest tests might perform the first function and not the second; but such tests would be useless in guidance.

The writer has been concerned with the differentiation of occupations, also with the differentiation of men from women (MF scale, chapter 11), of 15-year-old boys from older men (IM scale, chapter 12), and of laboring men from the upper socio-economic levels (OL scale, chapter 10).

A number of researches have been directed toward differentiating students majoring in one subject from students majoring in other subject areas. To date differentiation of subject areas has not been accomplished as satisfactorily as differentiation of occupations for a variety of reasons, the chief of which is the difficulty of obtaining good samples upon which to base the interest scale (chapter 20).

The data in chapter 7 thoroughly establish the fact that occupations can be differentiated in terms of interests. Men engaged in occupations so far studied have a characteristic pattern of likes and dislikes which differentiate them from men in other occupations.

The validity of such differentiation is unknown, for there is no known criterion to check against. There is an overlapping, for example, of 37 per cent between the scores of artists and those of

physicians on the artist scale and one of 7 per cent between artists and accountants on the same scale. Is the artist scale faulty in permitting any overlapping at all, or is it true that artists overlap in their interests with physicians far more than with accountants? Validity cannot be measured in terms of absence of overlapping unless it is established that there is actually no overlapping. As there is no better way of measuring occupational interests than that afforded by our scales, it must be assumed that overlapping varies greatly between pairs of occupations.[2] All our evidence points to this conclusion.

Classification of occupations.—Occupations may be classified into groups on the basis of the intercorrelations between scores on the occupational scales (see Table 29, p. 136). Through the use of factor analysis it is possible to plot occupations on the surface of a sphere. In this way their relationships to one another may be sensed in the same way that the relationships of countries or cities to one another may be shown on the surface of a globe. Figures 7 and 8 (p. 152) show such relationships for men's occupations. These figures are helpful in understanding how occupations are classified in terms of interests. They are useful in interpreting an interest profile.

Factor analysis has given us factors, or co-ordinates, which aid in classifying occupations, as indicated above. But so far they have not revealed the existence of any psychological traits which actually exist except as statistical abstractions. Doubt was raised above as to the existence of general interests as distinct from many specific ones. If there are no general interests, then it is futile to expect factor analysis to reveal such summary interest traits.

Hierarchies of occupations based on (1) intelligence, (2) interest (OL scale), and (3) income correlate in the neighborhood of .60. Psychologists have accepted the hypothesis that amount of intelligence is a determiner of entry to the better-paid and more socially approved occupations. It has long been held by people in general that such success is an expression of interest. Our data afford statistical confirmation of this belief. [Occupational-level (OL scale) scores are apparently about as useful as intelligence-

[2] See, for example, the tables of intercorrelations between occupations, facing page 716.

test scores in assigning men to their socio-economic level. It is quite possible that use of both these tests will give a more accurate assignment than that now obtained by the use of an intelligence test alone.

Scores on interest scales have little in common with scores on personality scales such as the *Bernreuter Personality Inventory* and the *Bell Adjustment Inventory;* they have slight association with intelligence-test scores (correlations ranging between .40 and —.40); but they are related in some respects to the Allport-Vernon *Study of Values* and the Minnesota Scale for the *Survey of Opinion.* This latter finding supports the view that interests and attitudes are related in some degree, as was pointed out in chapter 1. Further investigation as to the relationship between the scores of interest tests and other types of tests should help materially in the development of all such tests.

Relativity of differences.—If one is looking at a handful of change he will insist that a dollar and a cent are quite different. But if these two coins are lying in a desk drawer in which there are postage stamps, paper clips, pencils, erasers, rulers, sheets of paper, rubber bands, etc., then the dollar and cent will be judged very much alike. Similarity and difference are estimated in terms of some point of reference: in the illustrations above, the two points of reference are "coins" and "contents of a desk drawer."

The same principle applies to occupations: considering professions only, physician and lawyer appear far from similar; considering all occupations, including retail sales clerk, streetcar conductor, ditch-digger, bookkeeper, etc., physicians and lawyers show many points of likeness. Statistical confirmation of all this is given in chapter 21, where in the first case the correlation between physician and lawyer is .16 and in the second case .65. This principle of relativity of differences must be taken into account in measuring the interests of occupations.

Previous work has suggested that occupations in the lower socio-economic levels could not be differentiated from one another in terms of interests. We now know that these occupations appeared similar because they were being judged in terms of a point of reference (P_1) representative of the upper socio-economic levels. Interests of skilled workmen differ from professional and business

men sufficiently so that this difference overshadows the differences among the skilled trades. Consequently if scales for lower-level occupations are constructed by contrasting their interests with the interests of "men-in-general" representative of the upper strata (P_1), little differentiation between such occupations will result. But if instead a "men-in-general" group representative of the average man (P_2) is used in constructing scales for the skilled occupations, then differentiation between such occupations is possible.

This means that occupational scales should be based upon a "men-in-general" group that typifies the same socio-economic level as that of the occupation itself. Furthermore, men should be tested with occupational scales based upon the same socio-economic level as that to which the man belongs. The latter procedure is no more than that actually followed by counselors today. If the client is a first-class college student, his attention is called to the professions and the better-paid business activities; if the client is having difficulty with his high-school work, such occupations are not considered but rather the skilled trades.

A number of P_2 scales have been constructed for occupations at the skilled-labor level to be used with men who presumably belong in such occupations. Certain tentative conclusions are presented in chapter 22 regarding these scales; but further research is needed before their status as reliable, valid, and useful tests is established.

Differentiation of superior and inferior members of a group.— For a variety of reasons relatively little progress has been made in differentiating the superior and inferior members of a group, whether it be an occupational or educational group. This topic is considered at some length in chapters 19 and 20.

PREDICTION

Granted that occupations can be differentiated by an interest test, the assignment of an individual to some occupation involves at least three assumptions: first, interests are fairly permanent; second, interests are little influenced by vocational training and experience; and, third, a youth with the interests of an occupation will like to do the things that men engaged in the occupation will

like to do. It is obvious that if interests are not permanent and are influenced considerably by training and occupational experience it would be rather futile to assign a youth to an occupation in terms of his present interests. If interests are easily changed, it might be better to ignore them, to base guidance solely upon abilities, and then to provide for special training designed to make a task agreeable.

Permanence of interests.—Interests as measured on our interest scales are highly permanent. The correlation between occupational-interest scores when there is an interval of ten years between test and retest is .75. When the interest profile of a college senior is correlated with a second profile secured ten years later, the average of such correlations is also .75. Permanence measured in these two ways for younger students is slightly less, but such correlations compare favorably with the permanence of ability- and achievement-test scores. They are certainly high enough to warrant prediction based upon interests. It must not be overlooked, however, that these measures represent the average person—for some, permanence is much greater; and for some it is much less. We can never be certain, in the case of any one individual, that his interests will be as permanent as these figures suggest (chapter 15).

Influence of training and experience.—Interests are apparently little influenced by vocational training and actual experience in an occupation. Our data indicate that occupational-interest scores do not increase with occupational experience; in fact, in general they actually decrease slightly. There are also ample data showing that many young people possess clear-cut occupational interests prior to any educational or occupational experience. Carter and Jones conclude that "many high school sophomores have well-developed patterns of interests."[3] Apparently interests typical of occupations do not result from experience in the occupation, but rather the interests come first and the occupation is chosen because it provides a working environment in which the interests may be satisfied.

Part of the lack of permanence in interests is caused by changes

[3] H. D. Carter and M. C. Jones, "Vocational Attitude Patterns in High-school Students," *Journal of Educational Psychology* (1938), **29**, 333.

in interest with age. Fortunately these are not great. The correlation between the likes of 15-year-old and 55-year-old men is .73—usually considered a high correlation. The correlation between 15- and 25-year-old men is .82, and that between 25- and 55-year-old men is .88 (see Table 9, p. 91).

Validity of prediction.—There is still a third assumption which must be made if interest scores are to be used in vocational selection and guidance. This assumption is that a young man will enjoy the work of an occupation when his interests are in harmony with the interests of adult men found in that occupation. The possession of some ability must be assumed as well as of interest, for no one will be employed for any great length of time unless his work is fairly satisfactory and few can be interested in a job for long if they are not efficient.

No attempt has been made by us to measure efficiency or happiness on the job and to use these factors as criteria against which to measure validity of predictions based on interest scores. Instead we have used the criterion of being engaged in the occupation at the time of a follow-up, believing that such employment must indicate fair adjustment to the occupation in terms of ability and satisfaction, else the employment would have been terminated. Such a criterion is easily determined on an objective basis, whereas measurement of ability and satisfaction are difficult to accomplish.

Since it cannot be assumed that every man eventually finds the correct occupation for him, a guidance test cannot be adequately validated against occupation-engaged-in some years later. The best basis for such evaluation is, first, to show that those who are satisfactorily adjusted in an occupation can be differentiated by the test from those who are not satisfactorily adjusted, including also those not engaged in the occupation; and, second, to show that young people who obtain scores comparable to the satisfactorily adjusted group enter that occupation in reasonable degree and those who do not obtain such scores enter other occupations. Perfect correlations cannot be expected here, since economic conditions do not permit complete freedom of choice.

A ten-year follow-up of college seniors and a nine-year follow-up of college freshmen indicate that there is a good relationship between interests possessed in college and subsequent occupational

careers. This is true on the average; but there are individual exceptions. When we take into account the number of cases in which these young men are engaged in work which they indicate is not to their liking and are still making an effort to pursue another course, it seems likely that the results are about as good as can be expected under the circumstances.[4] Too good relationship between early interests and any criterion now available would arouse the suspicion that there must be something wrong with the interest measurements, for interests and actual occupational activity cannot be expected to correlate perfectly in this imperfect world.

Interpretation of interest profiles.—When a man is being considered for entrance to some occupation a high or low score in that occupational interest may often be accepted as indicative of future success or failure so far as interests contribute to the outcome. But when an applicant has an intermediate score, such as a B or B+ rating, the decision must rest on other considerations. In such cases interest scores on other occupations may be enlightening. Thus, a man with B+ rating in realtor and A in sales manager is a much better prospect for life insurance work than one with B ratings in these two occupations. Frequently scores on all the occupations lead to an interpretation different from that obtained on only one scale. Thus an A rating on personnel manager means interest in social science work when accompanied by high ratings in Group V and no high ratings in business activities; but it suggests personnel work in industry when accompanied by significant ratings in production manager, sales manager, office work, accounting, etc. Or it may be interpreted as meaning manager of production or sales with personnel interest to back these up. The more one handles such cases the more loth one becomes to base guidance upon only one score.

In the case of guidance, the more occupational-interest ratings the better. Even when a student says he wants to enter engineering and rates A in it, the decision to go into engineering cannot be accepted as certainly wise. He might rate A on several other

[4] For example, a purchasing agent, ten years out of college, who has consistently stated he wanted to be an author and has spent his spare time writing and taking correspondence courses. At present his occupation is out of harmony with his interest scores in college; if he eventually becomes an author, the interest test will be vindicated, as he rates A in author.

occupations and after these have been called to his attention may change his program. Not only should all possible occupational-interest scales be scored in vocational counseling but all the scores should be taken into account. Very low scores are positive indicators of what not to do. Frequently they are quite helpful in counseling. A college boy who had always planned to enter law rated a low C in that profession. Here one could say, "You positively lack the necessary interests," which cannot be said respecting a B rating. The latter might change to B+ or even to A ten years later; but a low C has very slight chance of shifting to A. All high ratings need to be considered. A choice must be made among them or, better, some sort of synthesis may be arrived at by which two or more high ratings may be combined into one vocation. Frequently the secondary ratings throw considerable light upon the proper decision. An A rating in psychologist with B+ ratings in physician and dentist should suggest a different preparation and career than an A rating in psychologist with B+ ratings in engineer, production manager, and carpenter. Chapter 17 considers other phases of this subject, emphasizing particularly the need to consider all available interest scores and not merely one.

Pure and applied points of view.—Pure and applied scientists look at predictions in a somewhat different light. The former is mindful of the lack of perfection in the reliability and the validity of tests; he realizes that no prediction can approximate certainty, and that in a given case the prediction can be actually wrong. The applied psychologist looks at the problem to be solved: a boy must decide today whether to major in engineering or something else. The counselor, if he is any good, knows the limitation of his tools; but his primary concern is to help the boy make the wisest decision possible. That decision may be wrong—many decisions must be wrong, for 100 per cent perfection is not possible—but if the boy is helped to make a better decision than he would otherwise have made, the counseling is justified.

The academic psychologist is frequently very contemptuous of what the applied psychologist does, partly because he does not need to face these realities of life. But when he ceases to be a pure scientist and plays golf or employs a physician he accepts decisions of the same sort that the counselor utilizes. Professor Ter-

man tells me that the correlation of golf scores between the first and second 18 holes in championship play is usually about .30. A friend calculated the reliability of diagnosis in a certain hospital to be about .40. Despite reliabilities of this very low order, everyone accepts the acclaimed golf champion and employs a physician when he is sick.

When one employs a physician one expects him to use the best techniques known to medical science. Similarly, a counselor should know all possible techniques in his field and use them in the most approved manner. Criticism of counseling should be directed not at the fact that less than 100 per cent procedures are employed but at the present disposition of authorities to employ people as counselors with little regard as to their technical qualifications. The need is great for well-trained men and women for this type of work.

What is accomplished by scoring an interest inventory was stated in chapter 2. Understanding all this is so important the subject will stand repetition, expressed in different language. The test is useful in that it makes it possible for young people to indicate their liking for specific activities one at a time. This they can do when at the same time they are often unable to verbalize the sum total of all their interests. Scores based on all the specific responses aid the student to select an occupation when he does not know the interests associated with the various occupations even if he has sized up his own interests correctly. The interest test eliminates then the necessity (1) of knowing what is involved in the various occupations, (2) of cataloguing one's interests and estimating their relative values, and (3) of determining which occupations will provide maximum opportunity of doing what one wants to do and minimum necessity of doing what one does not want to do.

It should be added, however, that no one should blindly accept the guidance indicated by the interest test until he has ascertained what is required in the indicated occupation and has determined that he has the abilities and interests required for the work. Knowledge of one's interest scores makes such a determination possible, for now one or only a few occupations need be investigated instead of all of them.

Chapter 4. Use of Vocational Interest Blank

The use of the interest blank may be expressed as follows—Men engaged in a particular occupation have a characteristic set of likes and dislikes which differentiate them from men in other occupations. The *Vocational Interest Blank* (following p. 726) is a device by which such patterns of interests may be determined. By means of the test, it is also possible to ascertain the pattern of interests with which a given individual's interests most nearly coincide, and hence the occupation for which he is presumably fitted so far at least as his interests are concerned.

It is assumed that, if a man likes to do the things which men like who are successful in a given occupation and dislikes to do the things which these same men dislike to do, he will feel at home in that occupational environment. Seemingly, also, he should be more effective there than somewhere else, because he will be engaged, in the main, in work he likes.

This and the next chapter present some of the facts which are needed by one who wishes to use the *Vocational Interest Blank.* Here we have a description of the test, discussion of its scope and purpose, instructions for taking the test, the interests that can be measured, the criterion groups upon which the scales are based, the 1938 revision of the men's blank and scales, the scores used, and the procedure for scoring the blank.

Chapter 5 outlines how interest scales are constructed, the norms determined, and the final scores reported. The contents of the chapter aid materially in comprehending what interest scores mean. This is particularly important, for they are not comparable to scores on most tests.

THE VOCATIONAL INTEREST BLANK

The blank consists of 400 items. The person being tested responds by indicating whether he likes, dislikes, or is indifferent to

each item. In addition to 100 items having reference to occupations, there are a list of amusements (golf, fishing, etc.), a list of school subjects (algebra, agriculture, etc.), a list of activities (repairing a clock, handling horses, etc.), and a list of peculiarities of people (progressive people, quick-tempered people, etc.). Part Six provides opportunity to indicate which three from a list of ten activities are most liked and which three are least liked. Part Seven asks for preference between two items, as for example: "Deal with things or deal with people." Finally, Part Eight calls for an estimate of one's present abilities and characteristics, as, for example, whether or not one can "win friends easily."

There is one form to be used with males and another form for females.[1]

SCOPE AND PURPOSE OF TEST

The test has been devised as an aid to young men and women in making their occupational choices. It is a measure of one's interests interpreted in terms of thirty-nine occupations for men and in terms of eighteen occupations for women.[2] It is not a measure of specific or general abilities. Such abilities should be determined by other means and considered together with interest ratings in determining a person's vocational choice.

Minimum age.—The test has been standardized in terms of the interests of men known to be successful in their own occupation. These criterion groups average about 40 years of age. As interests change very little from age 25 to age 55, the test is distinctly applicable to adult men within this age range. Changes of interest with age[3] are relatively slight from 20 to 25 years of age, so that here also the test is quite applicable. Because the changes in interest are considerable between the ages of 15 and 20, it appears from experience that the test should not be used with boys below 17 years of age except by a competent counselor. It is likely that the interest pattern will change somewhat in the next few years, particularly in the direction of higher scores in Occupational

[1] Except where specifically stated, the discussion in this text is concerned with the form devised for men.

[2] The 39 occupations are listed on p. 61, the 18 occupations on p. 718.

[3] This topic is considered in chapters 12 and 13.

Group V.[4] No study has been reported of the changes of interests of women with age. Since females mature more rapidly than males, it is likely that the test can be used more safely at seventeen with girls than with boys.

As an aid in vocational guidance.—The primary use of the test is with those young men and women who are honestly desirous of discovering the occupation for which their interests best fit them. See particularly chapters 17 and 18.

As an aid in educational guidance.—Scales for the *Vocational Interest Blank* have not as yet been developed for measuring interests characteristic of college majors. Progress in this direction has been reported by others; see chapter 20, where the topic is discussed as some length.

When the occupational objective is known, it is usually not a difficult matter to advise a student regarding his course of study. Unfortunately, a good-sized minority of students seem to lack such an objective. An occupational interest profile should provide such students with useful hypotheses as to which way to go and more particularly as to which ways not to go. The writer firmly believes that a certain amount of trial-and-error experimentation with courses in different departments is valuable, if not necessary, before some students will settle down to the task of directing their activities toward a distant goal.

As an admission requirement to professional schools.—There are two major problems in the selection of students for college. First, there is the problem of selecting applicants who will do satisfactory scholastic work in school. Second, there is the problem of selecting applicants who after graduation will be successful practitioners, enjoy their work, and be a source of pride to the profession. It is quite true that unless a student has the ability to study he will never have the opportunity to practice. But it is also true that if ability to pass examinations is the sole criterion for selection and graduation there will be graduated almost every year men who are no credit to either their alma mater or their profession.

In the selection of students who will do satisfactory scholastic work, reliance must be placed on records of scholastic work in high

[4] The classification of occupations into groups is given in Table 29, p. 136.

school and college, on intelligence-test records, and on special-aptitude tests. What the student has accomplished in the past is a fairly good index of what he can do in the future. Test records also indicate what he is capable of doing in the future. These measures are helpful, but they do not foretell with certainty what the student will do.

As occupational-interest scores correlate in the neighborhood of zero with intelligence,[5] it is evident that the test measures other factors than those involved in general intelligence. It is consequently not to be expected that interest scores on this test will aid appreciably in the selection of students who can pass the required college courses.[6] Its use as an admission requirement is rather to select those men who will like the occupational activities after graduation. Such men are more likely to continue in college if they have the requisite abilities to do good scholastic work, because they like that kind of work and will enjoy the work of the occupation after graduation. If they do not like such work they will either quit the profession or curse themselves for not having chosen something else.

As an aid in selection of employees.—Business has been content if an employee did his work satisfactorily; it did not worry if the employee was discontented. From now on business will be more concerned about discontented employees because they are likely to be the foci for trouble, and a few such individuals can precipitate very expensive labor disorders. Business will come more and more to realize that good selection of a man for a given job is not sufficient; there must also be good guidance of each applicant and employee into the job for which he is best fitted.

Judging from reports made to the writer, the interest test is proving satisfactory as an aid in the selection of candidates for selling. Here one of the major factors in considering applicants is whether or not they will like the business. See chapter 19 for data on this point.

It would be very interesting to survey several offices and determine how far the *Vocational Interest Blank* would aid in reassign-

[5] See p. 332.

[6] See chapter 20 for evidence that to some extent scores on the interest test do foretell scholastic performance.

such employees to jobs more congenial to their qualifications nd interests and to note finally how far the changes have improved he general morale of the entire office.

The *Vocational Interest Blank* should prove useful particularly n those situations where there is high turnover because of loss of nterest in the job, for it is an aid in determining not so much who vill be efficient as who will like the work and wish to continue in it.

When hiring a man for a position it is recommended that he be onsidered to have passed the interest test for that occupation if he btains an A or B+ rating, to have barely passed with a B rating, nd not to have passed with a B— or a lower rating. It must be nderstood, at the same time, that many elements contribute to uccess and that interest is only one of them.

INSTRUCTIONS FOR TAKING THE TEST

The instructions for taking the test are printed on page 2 of the lank following page 726. No time limit is given, but it is believed at better results will be obtained with the individual checking e blank rapidly, that a truer test of likes and dislikes is possible first impressions are recorded.

It has been demonstrated that if students desire to do so, they n raise their scores quite significantly.[7] Consequently if the test employed for admission purposes it should be given with emhasis upon filling the blank in minimum time in order to prevent udents figuring out the proper responses. It is suggested that e students be told that half the class should finish in 35 minutes d that as soon as each has finished he should turn in his blank so at the time he required may be entered by the instructor. (The ne required by adult men is: Q_3, 25; Median, 30; Q_1, 37 mines. From boys in the junior class in high school the following ta as to time required have been obtained: Q_3, 29; Median, 36; d Q_1, 44 minutes. Eleven per cent of this group of over 1,000 quired 50 or more minutes.)

When men are really desirous of knowing what occupation they ould enter, there is no danger that they will falsify their reacns. For this reason it seems preferable to give the test so that s motive is appealed to, whenever possible.

[7] Discussed on page 683.

INTERESTS THAT CAN BE DETERMINED BY THE TEST

Scoring scales (stencils) are available for measuring interest in occupations and also for certain other nonoccupational interests.[8]

Occupational interests of men

1. Accountant
2. Advertising man
3. Architect
4. Artist
5. Author-Journalist
6. Aviator
7. Banker
8. Carpenter
9. Certified public accountant
10. Chemist
11. City school superintendent
12. Coast guard*
13. Dentist
14. Engineer
15. Farmer
16. Forest service
17. Lawyer
18. Life insurance salesman
19. Mathematician
20. Mathematics-science high-school teacher
21. Minister
22. Musician
23. Office worker
24. Osteopath*
25. Personnel manager
26. Physician
27. Physicist*
28. Policeman
29. President of a manufacturing concern
30. Printer
31. Production manager
32. Psychologist
33. Public utility salesman*
34. Purchasing agent
35. Real estate salesman
36. Sales manager
37. Social science high-school teacher
38. Y.M.C.A. physical director
39. Y.M.C.A. secretary

* Not published.

Occupational group scales[9]

1. Group I
2. Group II
3. Group V
4. Group VIII
5. Group IX
6. Group X

P_2 scales. These scales are described and listed in chapter 22.

[8] For sale by Stanford University Press, Stanford University, California.

[9] The grouping of occupations is given in Table 29, p. 136. Group scales are discussed in chapter 9.

Nonoccupational interests

1. Interest maturity, see p. 246.
2. Masculinity–femininity, see p. 216.
3. Occupational level, see p. 185.
4. Studiousness, see p. 539.

Occupational interests of women.—The occupational criterion groups for women (p. 699) concern the occupational interests for which the blank can be scored at the present time. A revision of the women's blank and the original scales, together with the addition of new scales, is in process.

Criterion groups.—Detailed information is given in Chapter 27 (p. 694) concerning the composition of the various criterion groups employed in the construction of interest scales. Occupations, as used in this test, must be defined in terms of the kinds of men and women included in these groups.

1938 REVISION OF THE MEN'S BLANK AND SCALES

The original form of the *Men's Vocational Interest Blank* (A), with 420 items, was published in May 1927. A special form (B) for students appeared in November 1934. The present revised form (M), with 400 items, was issued in October 1938.

Form WA for women was published in January 1933. A special blank for students (WB) was issued in November 1934. A revised form (W) will be published in 1943, consisting of 400 items printed in groups of five items each, not four each as at present.

The revised scales for men are not quite identical with the original scales, since both the criterion occupational groups and the men-in-general group, constituting the point of reference, have been changed somewhat. That the changes are not great is evidenced by the fact that the average correlation between 29 old and revised scales is .929. (See Table 197, p. 724.)

The "men-in-general" group has been completely revised. The composition of the old group is given in Table 185 (p. 703), that of the new group in Table 190 (p. 712). The former men-in-general group was a mere summary of most of the vocational interest blanks in our files at the time it was constituted. We know now

that it happened to be an exceedingly good criterion group for the purpose.

In revising the whole procedure it was planned to constitute a men-in-general criterion group which would be a good sampling of men between the ages of 18 and 60 years, distributed according to age and occupation as given in the United States census. Why this criterion group was discarded is considered at length in chapters 21 and 22. After experiments with a number of possible men-in-general groups, it was finally decided to employ the one given in Table 190 (p. 712), which is a fair representation of business and professional men earning $2,500 and over a year.

When this men-in-general group is used as a point of reference in calculating a vocational interest scale, the resulting scores indicate how a given occupation differs in its interests from those of business and professional men earning $2,500 a year. This is logically a sounder procedure than to compare occupations of interest to educated men with the interests of the average man in the United States, which is at the level of skilled men. An educated man is not interested in how he compares with semi-skilled or even skilled men, but only how he compares with men making at least $2,500.

Several additional changes were made in 1938. The format of the blank was altered and twenty items were eliminated, reducing the total to 400 (see p. 723). Kelley's revised formula[10] was used in calculating weights for scoring the items, and the range of weights was reduced from ±15 to ±4. The change in formula and the reduction in range of weights together give practically the same differentiation as that obtained previously. Raw scores are expressed in terms of means and standard scores instead of in terms of medians and quartiles,[11] thus:

[10] See p. 611.

[11] At the beginning of the research the criterion groups were small and it was believed that quartiles obtained by actual count were more reliable than calculated sigmas, because no matter how much care was exercised in selecting the members of a criterion group there were always from one to five per cent who scored from —1 to —250 raw score. The amount of these C ratings was largely a matter of chance, affecting the sigma considerably but not the quartile.

With larger samplings this situation is practically eliminated. Considerable research indicated that essentially the same results were obtained by the quartile and the sigma, whether calculated or determined by count of cases. This is possible, of course, only when the distributions of scores are normal; inspection of the data indicates that they approximate normality.

Ratings	Former Value	Percentage of Normal Distribution	Present Value	Percentage of Normal Distribution	Percentage Based upon Actual Distribution[a]
A	—1Q and above.....	75.0	—0.5σ and above	69.2	70.2
B+	—1Q to —2Q	16.1	—0.5σ to —1σ	15.0	11.9
B	—2Q to —3Q	6.7	—1.0σ to —1.5σ	9.2	9.6
B—	—3Q to —3½Q.....	1.2	—1.5σ to —2.0σ	4.4	4.8
C+	Not used	....	—2.0σ to —2.5σ	1.6	2.5
C	—3½Q and below...	0.9	—2.5σ and below	0.6	1.0

[a] Based on tally of distributions of scores of ten criterion groups on their respective scales.

PROCEDURE IN SCORING A BLANK

The blank must be scored separately for each occupational scale. If scores, for example, are desired upon thirty occupations, it is necessary to score the blank thirty times.

There are four procedures in use today for scoring the blank. The first is hand scoring, the second is scoring with the Hollerith machine,[12] the third with the International Test Scoring Machine, and the fourth with the International Business Machine's Counting Sorter.[13] Which procedure should be used depends upon the volume of scoring, the promptness with which reports must be rendered, and other conditions. The necessary instructions are supplied by the Stanford University Press, Stanford University, California, which distributes the stencils and norms.

In order to aid those unfamiliar with scoring to understand the basic procedure, the following details are given here pertaining to hand scoring.

Stencils are provided for each occupation. Each stencil includes nine slips of cardboard, corresponding to the nine columns of items on the blank. On each slip are printed three columns of figures. To illustrate this and the method of using the scale, the first five items on the blank are given below and opposite them the scores which appear on the scoring stencil for lawyer interest.

Actor	L	I	D	1	0 —1
Advertiser	L	I	D	—2	1 1
Architect	L	I	D	—1	0 1
Army Officer	L	I	D	1	0 0
Artist	L	I	D	0	0 1

[12] P. J. Rulon and W. Arden, "A Scoring Technique for Tests Having Multiple Item-Weightings," *Personnel Journal* (1930), **9**, 235–41.

[13] R. Bedell, "Scoring Weighted Multiple Keyed Tests on the IBM Counting Sorter," *Psychometrika* (1940), **5**, 195–201.

If a person should circle L opposite all five of these items he would be given the following scores: 1, —2, —1, 1, and 0, totaling —1. To score the blank, then, one must ascertain the 400 weights assigned to the L's, I's, and D's that have been circled and then total them, observing the algebraic signs. (See Table 3, p. 75.)

SCORES

The raw score equals the sum of the 400 weights assigned to the responses to the 400 items on the *Vocational Interest Blank*. This score indicates not the *amount* of interest possessed but the *likelihood* that the person has or does not have the interests of men in the given occupation. A high score means that the individual has the interests of the occupation in question, while a low score means that he does not have such interests. "Occupation" is used here to mean "the men engaged in making a living in the occupation," for we are concerned with analyzing not an occupation but the men who work in the occupational environment.

As mean raw scores vary considerably from one occupational scale to another it is impossible to compare them until they have been transmuted into (*a*) standard scores, (*b*) ratings, or (*c*) percentiles.

Standard scores.—The formula for a standard score is $10\frac{X-M}{\sigma}+50$, in which X is the raw score, M the mean of the distribution, and σ the standard deviation of the distribution. Fifty is added to obviate negative scores and decimals. In Table 1 we have the distribution of 241 architects on the architect-interest scale. Their mean raw score is 124.3 and the σ of the distribution is 49.54. The mean raw score is called 50 standard score, and a range of 49.54 raw scores is now called a range of 10 standard scores. Consequently a standard score of 60 is equal to 124.3 + 49.54 or 173.84, etc. From the table we can read directly the standard score for any raw score on the architect-interest scale. Thus if one individual obtained a raw score of 180, he has a standard score of 61. In terms of percentiles he has scored as high as 87 per cent of architects and higher than any of the Stanford University students. If, on the other hand, our individual received a raw score of zero, he is assigned a standard score of 25, which means that

TABLE 1

NORMS FOR THE ARCHITECT SCALE*

Architects			Percentiles		
Raw Score	Standard Score	Rating	241 Architects	306 Stanford Freshmen	285 Stanford Seniors
220	69	A	99	..	..
210	67	A	98	..	..
200	65	A	97	..	..
190	63	A	92	..	..
180	61	A	87	..	..
170	59	A	80	..	..
160	57	A	75	..	99
150	55	A	65	99	99
140	53	A	60	99	99
130	51	A	51	98	98
120	49	A	41	98	98
110	47	A	34	97	96
100	45	A	30	95	93
90	43	B+	25	93	91
80	41	B+	20	90	87
70	39	B+	15	86	83
60	37	B	12	83	80
50	35	B	7	77	76
40	33	B—	6	73	70
30	31	B—	5	67	65
20	29	B—	3	60	59
10	27	C+	2	55	53
0	25	C+	1	50	46
—10	23	C	1	44	40
—20	21	C	1	36	35
—30	19	C	1	31	29
—40	17	C	..	25	23
—50	15	C	..	20	18
—60	13	C	..	15	13
—70	11	C	..	13	9
—80	9	C	..	10	7
—90	7	C	..	7	4
—100	5	C	..	5	2
—110	3	C	..	3	1
—120	1	C	..	2	1
—130	—1	C	..	2	1
—140	—3	C	..	1	..
—150	—5	C	..	1	..
—160	—7	C	..	1	..

Score	Raw Score	Standard Score	Percentage
Mean	124.3	50	....
Sigma	49.54	10	....
Ratings:			
A	100 and up	45 and up	70.1
B+	75 to 99	40 to 44	12.4
B	50 to 74	35 to 39	10.0
B—	25 to 49	30 to 34	3.7
C+	1 to 24	25 to 29	2.5
C	0 and below	24 and below	1.2

Reliability ..... .905

* Similar data for each occupational scale are supplied with the scoring scales. Published by the Stanford University Press, Stanford University, California.

he scored higher than 1 per cent of architects but higher than 50 per cent of Stanford seniors.

Ratings.—Our experience indicates that it is difficult for a person inexperienced in psychological and statistical technique to understand the significance of interest scores when expressed in terms of raw scores, standard scores, or even percentiles. One reason for this difficulty is that such persons are familiar with tests of the type where the higher the score the better it is and where only scores somewhere near the upper limit are really significant. To such persons a raw score of 120 on the architect-interest scale, for example, does not appear particularly significant, since it is 100 points below the upper limit and 51 per cent of architects score higher than 120.[14] (See Table 1.) In the case of the interest test, however, the score is a measure of how nearly a person's interests coincide with those of the *average* person successfully engaged in the occupation. Because of this it appears that there is no particular relationship between ability or efficiency and interest scores over the range of scores obtained by approximately two-thirds of the criterion group scoring highest on the test (i.e., from 100 to 220 on the architect scale). Consequently in interpreting scores within this range there is no particular value in pointing out that the score is 190, for example, instead of 110, and there is danger of giving a really false impression.

For guidance and employment purposes it is sufficient to interpret raw scores in terms of the ratings of A, B+, B, B—, C+, and C (see bottom of Table 1). The rating A means that the individual has the interests of persons successfully engaged in that occupation; the rating C means that the person does not have such interests; and the ratings B+, B, and B— mean that the person probably has those interests but we cannot be as sure of that fact as in the case of A ratings. From the data at hand it appears that those with B+ ratings average somewhat less in efficiency than those with A ratings but that some with B+ ratings rank very high, so that no prognosis may be made between degree of success of men with A and those with B+ ratings. Those with C ratings, on the other hand, have too little interest to belong to the

[14] Use of standard scores is even more difficult for the layman to comprehend. Thus the difference between 60 and 65 is not impressive although it is statistically significant.

group. Consequently it is seldom that persons with C ratings are engaged in the occupation, and if so engaged they are either indifferent successes who are likely to drop out or are carrying on the work in some more or less unusual manner. The latter situation is exemplified by a physician with a rating of C in the interests of a physician who has ceased to practice medicine and devotes his whole time to being superintendent of a hospital.

But ratings are not satisfactory to the statistician or to anyone who wishes to deal with the most accurate measurements possible. Use of these ratings amounts to substitution of a scale of 6 categories in place of a continuous scale. The ratings, A, B+, B, B—, C+, and C are ordered categories; but they do not represent equal steps on a scale, and they ignore most of the measurement which has taken place. This is true because they treat as alike all the scores falling within the limits of very wide intervals; this is particularly true of the A and C ratings.

To meet the needs of these two entirely different groups of persons, the layman and the statistician, standard scores are given on the specially devised Report Blank so that they can be easily translated into the letter ratings. See Figure 27, p. 421.

Every test has a certain degree of dependability for prediction. Roughly the dependability of this test may be stated as follows:[15] If A, B+, and B are considered as indicative of having the interests of an occupation and B—, C+, and C are considered as indicative of the reverse, then it is possible to say that ten years later, when tested again, the chances that one will receive an A, a B+, or a B rating are as shown below.

Initial Rating	Rating 10 Years Later
A	94 per cent
B+	79 per cent
B	62 per cent
B—	42 per cent
C+	28 per cent
C	9 per cent

Percentiles.—The norms for each scale include percentiles for three groups: (*a*) the criterion occupational group, (*b*) college freshmen, and (*c*) college seniors at Stanford University. The

[15] See Tables 97 to 99 and 103 to 105, pp. 365 and 371, for a more precise statement of relationships.

last two when compared with the first set of percentiles give an idea of how the scores of college students at Stanford overlap the criterion group.

There seems to be an insistent desire in certain quarters to interpret raw scores in terms of the scores of students, possibly because that is a common practice with most tests. Some institutions have gone to great trouble to establish percentiles for our occupational scales based upon their students. Instead of telling the subject he has a B+ rating in engineering, he is told 10 per cent of students in his institution score higher than he does in engineering. (At another institution the same raw score might place him in the 60th percentile.) Such percentiles must differ greatly from one educational institution to another, and far more so between departments or schools within a university. Such a use of interest-test scores seems very futile to the writer. It is entirely conceivable that in a small educational institution a student might have the highest interest score in certified public accounting and yet rate only B—. Telling him he has the highest score in that occupation might influence him to enter an occupation for which his interests do not fit him. Why disregard ratings which are validated against a definite objective criterion and substitute percentiles which have no known validity?

IMPROPERLY FILLED OUT BLANKS

Interest blanks may be improperly filled out for several reasons: first, from deliberate intention to falsify; second, through carelessness; third, through misunderstanding of the instructions; and fourth, through unusual conceptions of the terms "like," "indifference," and "dislike." Although it is easy to falsify the results (see p. 683), this actually happens very rarely as far as we have been able to discover. A few such records are apt to result when a whole class is required to fill out the blank. But when a man takes the test of his own volition, he tries to do it correctly. Carelessness is evidenced by omissions of part of the blank—most often the second column of occupational items. Another type results in marking L, I, or D not opposite the appropriate item. The first case is easily handled by returning the blank to be completed. The second case can be discovered only when a series of unusual

responses occur in a column. Grouping items in fives on the revised blank has presumably eliminated this type of carelessness, which was occasionally apparent when items were not grouped.

The most common form of misunderstanding of instructions is that exhibited by deliberating over each item instead of giving the first response that comes to mind. This is disclosed by the fact that an unusually long time is spent in filling out the blank. People vary considerably in the time required to fill out the blank, and consequently it is difficult to set up any standard requirement. Where the interest scores do not seem to be in harmony with the subject's expressed intention and the time of filling out the blank is excessive, it is well to have the blank filled out again after stressing the necessity of working rapidly.

Men probably differ with respect to what "like," "indifferent," and "dislike" mean, just as they differ in rating others where some rate too high and some too low as judged by the average. Excessive tendencies to use any one of the three categories too frequently will affect interest scores quite distinctly (see Table 92, p. 338). Consequently, blanks exhibiting extreme use of any one category should be questioned, although many report few likes, or few dislikes, as far as occupations go.

Another check on improperly filled out blanks is furnished by noting how closely all the raw scores approximate zero. If, when the scores are plotted on the Report Blank (Figure 27, p. 421), they fall within the shaded area or very close to it, the indication is that the test was carelessly marked, since the shaded areas indicate scores obtainable by chance. A small percentage of men give such scores, and from a study of many of these cases it appears that such men lack occupational interests—their whole conduct exhibits shiftlessness and indifference. But such records should be viewed with suspicion until it is established that the individual really expressed his interests.

Chapter 5. Scoring the Interest Blank

This chapter completes the general information about the *Vocational Interest Blank* which one should have in order to use it intelligently. More specifically the chapter outlines how scales are developed to measure interests, how norms for these scales are established, the reliability of the scales and scores, and how the scores are to be interpreted.

Since interest tests are developed in a somewhat different manner from most psychological tests, it is quite important that the reader understand the material in this chapter. Misunderstandings easily arise when one fails to grasp such facts as these: (1) interest tests measure differences in interests between groups; (2) scores indicate the degree of certainty that certain interests are possessed, not the amount of such interests possessed.

METHOD OF DIFFERENTIATING GROUPS

Differentiation of groups is measured by weighting the items which differentiate and ignoring, or practically ignoring, the remaining items. Detailed variations in procedure are disregarded here; some of these are discussed in chapter 23.

Since we have used two slightly different procedures in this connection, an example of each will be considered. In the first case the interests of two groups are contrasted, as males and females, or 15-year-old and 25-year-old men. In the second case, the interests of the men in one occupation[1] are contrasted with the average of men in many occupations, referred to as a men-in-general group.[2]

Differentiation of the interests of men and women.—The percentage of like, indifference, and dislike responses of the two

[1] Here and elsewhere the term "occupation" is employed to mean "men who are successfully engaged in earning their living in the occupation."

[2] Several men-in-general groups are employed in this research. See chapter 21.

groups are compared item by item, and a plus weight is given to those responses which are preferred by men and a minus weight to those items preferred by women, the size of the weight being determined by the degree to which the two scores differ. An example follows:

	Responses of Males			Responses of Females			Differences			Weights		
Item	L*	I	D	L	I	D	L	I	D	L	I	D
a	70	20	10	40	30	30	30	−10	−20	3	−1	−2
b	40	30	30	45	35	20	−5	−5	10	0	0	1
c	20	30	50	50	30	20	−30	0	30	−3	0	3

* L, I, and D indicate here and elsewhere "like," indifference," and "dislike"

Scoring can be done in terms of either the percentage differences or the weights. If, for example, a person likes items *a* and *b* and dislikes item *c*, he would obtain scores of 30, —5, and 30, a total of 55, in the first case, and 3, 0, and 3, a total of 6, in the second case. Such weights are preferable to mere differences, but it is important at this point to realize that a fairly satisfactory scoring system can be based on the mere differences in the percentages of the two scores.

The weight of 3 for liking item *a* is based on a difference of 30 per cent between the two scores. But 40 per cent of both sexes who like this item are ignored. Similarly the weights of —1 for being indifferent to item *a* and —2 for disliking it are based on differences of 10 and 20 per cent, respectively, between the two sexes. Here again there are 20 per cent of both sexes who are indifferent and 10 per cent who dislike the item. All in all, 70 per cent of the responses of the two sexes are ignored, since the scoring is based upon 30 per cent of the men who like the item more than women and 30 per cent of women who are indifferent to or who dislike the item more than men. Actually the scoring for the entire MF scale is based on only 13.5 per cent of the responses of the two sexes, since the two sexes agree in 86.5 per cent of their responses to all the items.[3]

The Terman-Miles MF test.[4]—The Terman-Miles MF test is

[3] The 86.5 per cent of common responses play a real part in the scoring system, since their presence reduces just that much the possibility of larger weights on the MF scale.

[4] L. M. Terman and C. C. Miles, "Sex and Personality" (McGraw-Hill Book Co., 1936), pp. 31–34. Their findings are considered to some extent in chapter 11.

representative of a variation from the procedure stated above as far as weighting of items is concerned. Their procedure was to hunt systematically in order to find items that differentiated the two sexes and to employ only those items that did so significantly. For example, in the development of Part 3, "Information Items," 200 items were selected from all those that occurred to the authors which it was supposed would differentiate the sexes. After a tryout only 91 of these items satisfied the criterion. Another set of 495 items was tried out, and 95 of them were utilized in the test. The essential difference between their procedure and ours is that the test of Terman-Miles contains only the items which differentiate the two sexes to the greatest possible degree, whereas our items were selected originally for a different purpose. Scores on their test represent the maximum differentiation that they were able to obtain; our test represents less differentiation. Because all items are retained in our test it is possible to measure both the similarities and the differences between the two sexes and to discover that the former outweigh the latter, as will be shown in the next chapter.

Differentiation of occupational interests.—The assumption is that vocational guidance must be based upon the factors that discriminate between the members of an occupation and other men. It is consequently appropriate to express the interests of an occupation in terms of how those interests differ from men-in-general. The procedure of scoring an interest test for an occupation is identical with that described above for the MF test except that all occupations are contrasted with the same men-in-general group,[5] instead of contrasting one occupation with another. Data on one item, "to be an actor," are sufficient to illustrate the procedure.

Occupation	Responses of Occupation			Responses of Men-in-General			Differences			Weights		
	L	I	D	L	I	D	L	I	D	L	I	D
Artist	40	30	30	21	32	47	19	−2	−17	2	0	−1
Chemist ...	16	34	50	21	32	47	−5	2	3	0	0	0
Carpenter .	11	32	57	21	32	47	−10	0	10	−1	0	1
Minister ..	42	33	25	21	32	47	21	1	−22	2	0	−2
Musician ..	34	48	18	21	32	47	13	16	−29	1	1	−3

(It will be noted that this illustration differs from the preceding one in that weights for one item are given for five occupational

[5] Exceptions to this procedure are discussed in chapter 22.

scales, whereas in the preceding example weights are given for three items on one scale.)

If a person says he would like to be an actor, he obtains 2 points toward having the interests of an artist and a minister, 1 point toward a musician, zero points toward a chemist, and —1 point toward a carpenter. The sum of such weights on 400 items constitutes the raw score on one scale of the test.

Such scores are based on the differences in interests between the occupation and men-in-general, and these differences are far less prevalent than the similarities in interests. Actually the weights for the five occupations are based on only 17 per cent of the original responses, 83 per cent of those responses being common on the average to the five occupations and to the men-in-general group.

PROCEDURE OF DEVELOPING AN OCCUPATIONAL SCALE

Before developing an occupational scale it is necessary to accumulate sufficient blanks filled out by members of the occupation to give a good sampling of the occupation and also a much larger number of blanks to represent men-in-general. The procedure of developing an occupational scale is as follows:

1. Tally the responses to each item according as they fall under the headings of liking, indifference, and dislike. This is done for both the occupational blanks and the men-in-general group.

2. Express the results in the form of percentages. Table 2 gives such percentages for the first ten items on the blanks for men-in-general and for engineers.

3. Calculate weights for liking, indifference, and dislike for each item by using the formula given on page 611 or by employing a chart prepared by the writer on which the weights, calculated by the same formula, are given opposite the two percentages which are to be contrasted. For example, given the two percentages of 21 and 9, the weight of 1 is obtained and, since fewer engineers than men-in-general like to be an actor, a minus sign is prefixed to the weight. The fourth section of Table 2 gives the weights for the percentages in columns one and two of the table. Such weights constitute the scale for scoring an interest blank.

Table 3 illustrates the scoring of an *Interest Blank*. The first

TABLE 2

DETERMINATION OF WEIGHTS FOR AN OCCUPATIONAL INTEREST SCALE AS, FOR EXAMPLE, ENGINEERING

First Ten Items on Vocational Interest Blank	Percentage of "Men-in-General" Tested			Percentage of Engineers Tested			Differences in Percentage between Engineers and Men-in-General			Scoring Weights for Engineering Interest		
	L	I	D	L	I	D	L	I	D	L	I	D
Actor (not movie)	21	32	47	9	31	60	−12	−1	+13	−1	0	1
Advertiser	33	38	29	14	37	49	−19	−1	+20	−2	0	2
Architect	37	40	23	58	32	10	+21	−8	−13	2	−1	−1
Army officer	22	29	49	31	33	36	+9	+4	−13	1	0	−1
Artist	24	40	36	28	39	33	+4	−1	−3	0	0	0
Astronomer	26	44	30	38	44	18	+12	0	−12	1	0	−1
Athletic director	26	41	33	15	51	34	−11	+10	+1	−1	1	0
Auctioneer	8	27	65	1	16	83	−7	−11	+18	−1	−1	2
Author of novel	32	38	30	22	44	34	−10	+6	+4	−1	1	0
Author of technical book	31	41	28	59	32	9	+28	−9	−19	3	−1	−2

TABLE 3

SCORES OBTAINED BY AN ENGINEER FOR ENGINEERING INTEREST; ALSO FOR INTEREST IN FIVE OTHER OCCUPATIONS, ILLUSTRATING METHOD OF SCORING THE INTEREST BLANK

First Ten Items on the Vocational Interest Blank	Scoring Weights for Engineering Interest			Responses of an Engineer to the Ten Items			Scores for Engineering Interest Obtained by This Engineer	Scores Obtained by This Engineer on Interest Scales for				
	L	I	D	L	I	D		Lawyer	Life Insurance Salesman	Minister	Y.M.C.A. Secretary	Accountant
Actor (not movie)	−1	0	1	..	..	x	1	−1	−1	−2	−1	−1
Advertiser	−2	0	2	..	..	x	2	1	−1	0	−2	−1
Architect	2	−1	−1	..	..	x	−1	1	1	0	0	0
Army officer	1	0	−1	..	x	..	0	0	0	−1	0	0
Artist	0	0	0	..	x	..	0	0	−1	1	1	0
Astronomer	1	0	−1	x	..	..	1	0	0	2	0	0
Athletic director	−1	1	0	..	x	..	1	0	0	1	0	0
Auctioneer	−1	−1	2	..	x	..	−1	−1	0	0	0	0
Author of novel	−1	1	0	..	x	..	1	0	0	0	0	0
Author of technical book	3	−1	−2	x	..	..	3	0	−1	−1	−1	1
Total 10 items							+7	0	−3	0	−3	−1
Total 400 items							+182	+23	−115	−91	−134	−33
Standard score							67	36	10	11	3	16
Rating							A	B	C	C	C	C

section of the table gives the weights for engineering interest as derived in Table 2. The second section of Table 3 gives the responses of a mining engineer to the first ten items on the blank. The third section gives the weights earned by this engineer on the engineering scale. He dislikes to be an actor, and that gives him a weight of 1; he dislikes to be an advertiser, and that gives him a weight of 2; etc. The total of these weights for ten items amounts to 7 and for all 400 items to 182. This is equivalent to a standard score of 67 (explained on p. 65) and to a rating of A (explained on p. 67). The last section of Table 3 gives the weights earned by this engineer on five additional scales. We judge that he has the interests of an engineer, to some degree the interest of a lawyer, but not at all the interests of a life insurance salesman, a minister, a Y.M.C.A. secretary, or an accountant.

It is well to recognize that the development of a scale for measuring an occupational interest is not based upon any prior theorizing. The scale is based upon the differences in interests of men in one occupation and of men generally. The raw score obtained by an individual is the sum of the weights he earns on such a scale. The weights are not expressive of anyone's theories but are statistically derived from the data.

NORMS

Having obtained a raw score—the sum of the weights for the 400 responses—the next step is to give meaning to this raw score. Two different kinds of meaning are involved. The first meaning concerns this individual and how he scored with reference to some standard group. *Did he, for example, score higher than 90 per cent, 50 per cent, or 5 per cent of successful engineers on the engineering scale?* The second meaning has reference to what can be predicted about this individual because he has obtained this score.

The most useful procedure for expressing how an individual has scored with reference to a criterion group is to convert the raw score into a standard score. The derivation of such scores was explained on page 65. The standard score indicates automatically just where an individual stands with respect to the distribution of scores of the criterion group on that scale. Furthermore, standard scores for different scales can be directly compared, since they all have the same positional meaning.

Before considering the second kind of meaning concerning prediction, it is best to stop and consider the reliability both of a scale and of a single score.

RELIABILITY OF INTEREST SCALES

Using the "odd-even" technique, the average coefficient of reliability of 36 revised scales for men is .877, as based on the records of 285 Stanford seniors (see Table 4). The coefficient falls below .80 in only one case—certified public accountant (.727). In fifteen cases the coefficient equals .90 or higher. Corresponding data for the women's blank are given in Table 5.

Scales based on twelve professional groups yield "odd-even" reliability coefficients of .906, whereas scales based on twelve business groups average only .855, and four trades average .852. The remaining eight scales fall between these extremes, averaging .881.

Remmers and Whisler[6] have reached the conclusion that "the 'odd-even' technique will in general yield higher self-correlations than will the 'equivalent forms' technique." Comparison, however, of our "odd-even" reliability coefficients with those of Burnham's "test-retest" coefficients for an interval of a week shows that the "odd-even" are on the average .031 lower than the "test-retest" coefficients (see Table 95, p. 360).

The reliabilities of the six group scales are given in Table 6. They average .917; only one of the six is below .90. Each of these coefficients is higher than the average of the coefficients of the occupational scales of which they are composed. The differences average .026.[7]

[6] H. H. Remmers and L. Whisler, "Test Reliability as a Function of Method of Computation," *Journal of Educational Psychology* (1938), **29**, 81–92.

[7] The student of reliability will be interested in the following rank-order correlations between data in Table 4 concerning 34 occupational scales:

	Size of Weights	Mean Score	σ of Criterion Group	σ of Seniors
r_{11}	.50	.49	.57	.78
Size of weights	...	.87	.85	.90
Mean Score	...	...	.76	.83
σ of criterion group	...	...	...	.91

Size of weights is a rough measure of average item value. The term represents the total of all weights for L, I, and D, divided by 400, signs being disregarded.

The same relationships do not hold for the group scales.

TABLE 4

RELIABILITY OF OLD AND REVISED SCALES, ODD-EVEN TECHNIQUE WITH (*a*) AVERAGE SIZE OF WEIGHTS; (*b*) STANDARD DEVIATION (RAW SCORES) OF CRITERION GROUP AND OF 285 SENIORS; AND (*c*) STANDARD ERROR OF A SCORE*

Scale	Reliability		Average Size of Weights	Standard Deviation		Standard Error of a Score
	Old Scales	Revised Scales		Criterion Groups	285 Seniors	
Artist	.92	.924	1.037	88.1	100.6	2.76
Psychologist	.89	.881	.886	52.7	73.2	3.45
Architect	.84	.905	.652	49.5	60.2	3.08
Physician	.88	.886	.517	41.4	54.5	3.58
Dentist	...	.844	.534	34.2	43.3	3.95
Mathematician	.90	.916	.957	69.6	86.8	2.92
Engineer	.94	.937	.562	42.4	62.8	2.51
Chemist	.89	.914	.607	41.9	66.4	2.93
Production manager	...	.848	.345	30.5	31.9	4.90
Aviator	...	.905	....	49.1	66.3	3.08
Farmer	.88	.885	.457	39.5	41.7	3.39
Carpenter	...	.901	.714	45.0	62.9	3.15
Printer	...	.802	.547	37.0	38.3	4.45
Mathematics-science teacher	...	.881	.674	53.1	59.7	3.45
Policeman	...	.831	.732	57.3	50.9	4.11
Forest service	...	.880	.636	37.4	....	3.46
Y.M.C.A. physical director	.89	.844	.712	51.9	55.2	3.95
Personnel manager	.78	.817	.457	30.8	35.1	4.29
Y.M.C.A. secretary	.88	.898	.797	59.7	67.6	3.19
Social science teacher	...	.885	.652	47.8	59.0	3.39
City school superintendent	.86	.844	.612	38.7	45.8	3.95
Minister	.92	.899	.858	58.9	70.3	3.18
Musician	...	.874	.591	35.6	45.0	3.55
Certified public accountant	.74	.727	.426	28.3	26.7	5.23
Accountant	...	.839	.367	29.2	32.6	4.01
Office worker	.89	.876	.421	34.2	35.0	3.52
Purchasing agent	.89	.854	.395	29.1	31.3	3.82
Banker	...	.828	.466	38.7	35.7	4.15
Sales manager	...	.904	.455	37.9	42.9	3.10
Real estate salesman	.90	.901	.445	46.2	42.2	3.15
Life insurance salesman	.90	.932	.519	48.9	58.3	2.61
Advertising man	.90	.908	.644	57.4	56.6	3.03
Lawyer	.90	.884	.503	44.7	48.3	3.41
Author-journalist	.93	.938	.969	107.5	98.4	2.49
President	...	.821	.344	27.8	24.9	4.23
Occupational level	...	.875	.692	....	49.1	3.54
Masculinity-femininity	...	.932	.786	....	83.3	2.60
Interest maturity	...	.932	....	....	....	2.61

* Reliability coefficients for ten scales based on the records of 64 high-school boys (mean age of 16.7 years) are reported by Taylor. These coefficients differ from those in the table on the average by .048. See K. von F. Taylor, "The Reliability and Permanence of Vocational Interests of Adolescents," *Journal of Experimental Education*, 1942, 11, 82.

TABLE 5

RELIABILITY OF OCCUPATIONAL-INTEREST SCALES FOR WOMEN*

Occupational Scale	Reliability Coefficient	Standard Deviation of Criterion Group (Raw Score)	Standard Error of a Score	Reliability as Calculated by Bedell[a]
Artist	.93	78.1	2.65	.90
Author	.94	80.9	2.38	.92
Dentist	.78	30.1	4.69	.80
Femininity-masculinity	.74	22.3	5.10	.98
General office worker	.92	59.7	2.83	.86
Housewife	.90	51.1	3.16	.82
Lawyer	.81	37.2	4.36	.82
Librarian	.87	36.9	3.61	.77
Life insurance saleswoman	.74	31.3	5.10	.71
Nurse	.87	28.5	3.61	.84
Physician	.87	43.8	3.61	.88
Social worker	.83	36.8	4.12	.74
Stenographer-secretary	.85	52.4	3.87	.81
Teacher of English	.82	22.6	4.24	.73
Teacher of mathematics and physical science	.84	35.5	4.00	.85
Teacher of social sciences	.86	26.5	3.74	.83
Y.W.C.A. secretary	.88	48.8	3.46	.71
Physical education teacher	.86[b]	39.6	3.74	.82
Elementary school teacher	.90	....	3.16	.83

* Data based on records of 500 married women Odd-even technique, corrected with Brown-Spearman Formula.

[a] Reported by R Bedell, University of Nebraska, based on records of 238 elementary school teachers. Taylor (*op. cit.*) reports coefficients for ten scales based on the records of 62 high-school girls (mean age of 17 years). They differ on the average from those in the table by .042. Laleger gives coefficients for 18 scales based on the records of 703 third-year high-school girls. They differ on the average from those in the table by .049 but several of her coefficients differ appreciably from ours, namely, MF of .94, librarian of .95, life insurance saleswoman of .58, nurse of .96, and social worker of .71. See G. E. Laleger, *The Vocational Interests of High School Girls* (Teachers College, Columbia University, Contributions to Education, 1942, No. 857), p. 26.

[b] When based on criterion blanks, .834, as reported by Patricia Collins, Temple University.

Reliability of individual scores.—Part of the lack of stability and permanence of measured interests is caused by the unreliability of the scores themselves. A standard score of 37.5 (average B rating) cannot be interpreted to mean exactly 37.5 but means rather a distribution of scores about 37.5 extending some distance above and below that amount. The best measure of this

distribution is the standard error of measurement, which we shall refer to as the standard error of a single score, i.e.,

$$\sigma_m = \sigma\sqrt{1 - r_{11}}$$

where σ = standard deviation of scores of the criterion group and r_{11} = reliability of the scale. When standard scores are employed, sigmas may be omitted, in which case σ_m is calculated directly from the coefficient of reliability. The standard error of a score can also be obtained by calculating the standard deviation of the differences of scores on the two halves of a test.

TABLE 6

RELIABILITY OF GROUP SCALES

(N = 285 College Seniors)

Group	Typical Occupation	Reliability Coefficient	Average Size of Weights	Sigma Raw Scores	Standard Error of a Score
I	Physician	.936	.506	51.5	2.53
II	Chemist[a]	.941	.644	61.6	2.43
II	Chemist[b]	.943	.520	43.3	2.39
V	Y. secretary	.905	.472	49.2	3.08
VIII	Accountant	.851	.282	24.6	3.86
IX	Life insurance	.935	.370	42.8	2.55
X	Lawyer	.934	.559	65.3	2.57
	Average	.917	....	....	....

[a] This scale has been superseded by another scale based on the records of only engineers and chemists. See page 173.

[b] Based on records of chemists and engineers only.

Coefficients of reliability for each of the men's revised scales are given in Table 4, together with the corresponding standard errors of a score. The accountant scale, for example, has a σ_m of 4.01, which means that the chances are 68 in 100 that the "true" score lies within the limits ± 4.01 from the obtained score. Thus if an individual scored 37.5 on the accountant scale, there are 68 chances in 100 that his "true" score lies between 37.5 ± 4.01, i.e., between 33.5 and 41.5. These limits extend beyond 35 and 40, the critical scores for a B rating; and consequently some of these 68 chances and all of the remaining 32 chances represent

possibilities the "true" score is above or below a B rating. The chances that the true score lies within certain limits are as follows:

C rating	below 25 standard score	.1 chance in 100
C+ rating	25 to 29.4	3.0 chances in 100
B— rating	30 to 34.9	23.6 chances in 100
B rating	35 to 39.9	46.7 chances in 100
B+ rating	40 to 44.9	23.6 chances in 100
A rating	45 and above	3.1 chances in 100

The accountant scale has a reliability of only .839—lower than we should like to have for any scale. The author scale has a far more satisfactory reliability of .938. If the obtained score is 37.5, the chances that the true score is in certain limits are:

C rating		
C+ rating	.1	chance in 100
B— rating	15.7	chances in 100
B rating	68.3	chances in 100
B+ rating	15.7	chances in 100
A rating	.1	chance in 100

Comparison of these two sets of chances makes clear the added advantage of a reliability of .938 over that of .839; for a score of 37.5 on the author scale means a B rating in 68.3 chances in 100, whereas the same score on the accountant scale means a B rating in only 46.7 chances in 100.

Table 7 supplies some additional calculations regarding the chances that a given rating means that rating or some other rating. Using the average σ_x of ten scales, i.e., 3.33, we find in the second part of the table that when the obtained rating is B there are 50 chances in 100 that the "true" rating is B, and that there are 23 chances in 100 the "true" rating may be a B— or B+, with 2 chances that it may be even a C+ or A.

The first part of Table 7 gives the summary of distributions of possible scores for 214 A ratings obtained by 168 college seniors on ten scales. On the average an A rating is a "true" A rating in 87 per cent of the cases, a "true" B+ rating in 12 per cent of the cases, and a "true" B rating in 1 per cent of cases. Similar data for C ratings are given in the third part of the table. The slight superiority of C ratings over A ratings is caused by the fact that average C ratings (17.0) fall 8.0 standard scores below a C+ rating, whereas the average A rating (50.7) falls only 5.7 stand-

ard scores above a B+ rating. Since younger men obtain fewer A ratings and A ratings of lower standard scores than adult men, their A ratings will not average as many "true" A ratings as in Table 7 based on college seniors and particularly as found among adult men.

TABLE 7

CHANCES IN ONE HUNDRED THAT THE TRUE SCORE OF AN OBTAINED RATING IS THAT RATING OR ANOTHER RATING*

Scale	σ_x	N	Average Standard Score	Below 25 C	25–29.9 C+	30–34.9 B−	35–39.9 B	40–44.9 B+	45 and Up A
	BLANKS RATED A								
Chemist	2.93	41	52.8	....	....	...	0.5	9.4	90.1
Artist	2.76	5	48.8	....	....	...	0.3	12.8	86.9
Certified public accountant	5.23	7	48.4	....	....	1.2	8.5	23.1	67.2
Advertiser	3.03	21	49.9	....	....	...	1.2	18.0	80.8
Engineer	2.51	39	53.1	....	....	...	.2	7.7	92.1
Farmer	3.39	26	50.1	....	....	...	1.3	13.9	84.7
Lawyer	3.41	35	50.1	....	....	...	.9	13.7	85.3
Life insurance	2.61	21	53.0	....	....	...	.2	5.2	94.6
Minister	3.18	0	....	....	....	...	...	....	....
Personnel	4.29	19	50.5	....	....	.1	3.3	16.2	80.3
Average	3.33	..	50.7	....	....	.1	1.1	11.9	86.9
	BLANKS RATED B								
Average	3.33	..	37.5	..	1.9	23.2	49.8	23.2	1.9
	BLANKS RATED C								
Chemist	2.93	63	12.5	95.4	4.4	.2	..	..	....
Artist	2.76	88	15.5	93.6	6.3	.2	..	..	....
Certified public accountant	5.23	77	19.3	77.7	16.5	5.2	.6	..	....
Advertiser	3.03	30	20.2	82.3	16.7	1.0	..	....	....
Engineer	2.51	60	15.4	92.0	7.9	.1	..	....	....
Farmer	3.39	34	19.2	87.0	12.2	.8	..	....	....
Lawyer	3.41	34	19.7	79.1	18.6	2.3	..	....	....
Life insurance	2.61	57	17.8	89.9	9.8	.3	..	....	....
Minister	3.18	131	13.8	91.9	7.5	.6	..	....	....
Personnel	4.29	42	16.5	88.2	9.9	1.8	.1	....	....
Average	3.33	..	17.0	88.8	9.9	1.2	.1	....	....

* All B ratings assumed to be 37.5; calculations respecting A and C ratings are based on the actual scores obtained by 168 college seniors.

It is not legitimate to say that any A rating has 87 chances in a hundred of being a "true" A as in Table 7. Such chances should be calculated in terms of the standard score of the A rating under discussion and the standard error of a score of that scale. The figures in the table give a general idea of what A, B, and C ratings mean. The data do emphasize that an A rating means a "true" high rating (A or B+) and a C rating means a "true" low rating (C or C+) in the majority of cases when unreliability is taken into account.

Comparative reliability of interest scales and other tests.—Baxter and Paterson suggest that the real measure of efficiency of a test is best expressed[8] by the formula:

$$\frac{\sigma_x}{\sigma}, \text{ which equals } \frac{\sigma\sqrt{1 - r_{11}}}{\sigma} \text{ or } \sqrt{1 - r_{11}}.$$

On this basis they report the following, where the smaller the ratio the more reliable the test:

Tests	$\sqrt{1 - r_{11}}$
Achievement tests	.20
Scholastic aptitude tests	.30
Reading tests	.32
Special aptitude tests	.33
Personality tests	.40

Our MF and IM scales would fall about halfway between the first two in this table, the twelve scales for professional occupations would fall between the second and third classes, and the remainder of our scales would fall between the last two groups. It is rather puzzling that scales involving the interests of men engaged in trades or business should have lower reliability than scales involving professional men.

REPORT BLANK

Scores on any test should be given on a report blank which is easy to fill out, easy to understand by those who receive it, and at the same time as scientifically accurate as possible. Any report blank that is adopted will necessarily be a compromise adaptation of these three factors. The report blank recommended by us is shown in Figure 27, page 421.

[8] B. Baxter and D. G. Paterson, "A New Ratio for Clinical Counselors," *Journal of Consulting Psychology* (1941), **5**, 123–26.

From the standpoint of care in filling out the blank, it would be desirable to have the occupations listed alphabetically and merely to record raw scores. It is, however, such a great advantage in understanding the significance of all the scores to have the occupations grouped according to their similarities in interests that such grouping must be utilized (see chapter 8).

Since raw scores cannot be interpreted until transmuted into standard scores or ratings it is obvious that the latter should be reported. Since ratings can be directly obtained from standard scores and as standard scores give more detailed information than ratings, standard scores have been adopted as the type of score to report. This means that after a blank has been scored, each raw score must be transmuted into a standard score by reference to a table[9] giving this information. To fill out the report sheet it is only necessary to record name and age of the subject, the date, and the standard scores.

To be properly understandable, the standard scores should be plotted on the report blank in profile form. This may be done by the person filling out the report blank. But because the mere act of plotting forces a clearer comprehension of the data, it is recommended that the subject plot his own data.

MEANING OF A SCORE

Three considerations need to be taken into account in interpreting the scores of the *Vocational Interest Blank*. First, to what extent is the score an expression of possessing the interests of the occupation? Second, to what extent do men who are successfully engaged in the occupation have similar scores? Third, to what extent are the scores obtainable by chance?

Each of the three responses to the 400 items is weighted according as a greater or smaller percentage of the occupational group react in that way than the percentages of the men-in-general group. Accordingly, if a total score is plus, it means the individual has interests more in common with the criterion group than the men-in-general group; if the score is negative, the reverse is the case. On this basis only positive raw scores can be construed

[9] Such tables are supplied with the scoring stencils by the Stanford University Press.

to signify possession of an occupational interest. (Zero raw scores transmuted into standard scores are reported in Table 8, for each scale.)

The second consideration is concerned not with whether the raw score is plus or minus but with the extent to which men engaged in the occupation have similar scores. On the average, 4 per cent of an occupational criterion group score below zero on their own occupational scale, as is evidenced in the table. Actually the percentage varies from 0 to 20 per cent, realtors having 20 per cent, farmers and author-journalists 12 per cent, printers and advertising men 10 per cent, musicians 8 per cent, and physicians and office men 6 per cent. Seemingly a raw score of —10, for example, ought to be symptomatic to some degree of interest in farming or real estate selling when 7 per cent of farmers and 13 per cent of realtors score lower than —10 on their own scales. In accord with this conception, ratings of A, B, and C are used which are to be defined in terms of the percentage of the criterion group receiving certain scores. Thus an A rating is given to those scores obtained by the 69.1 per cent of the criterion group obtaining the highest scores, a B+ rating to the scores obtained by the next 15.0 per cent of the criterion group, etc. But this system results in significant ratings being assigned to minus raw scores, as for example:

Occupational Scale	RATINGS	
	B—	B
Realtor	—46 to —24	—23 to 1
Farmer	—24 to —5	—4 to 14
Author-journalist	—64 to —11	—10 to 42
Printer	—28 to —11	—10 to 8
Advertiser	—29 to —1	
Musician	—18 to —1	
Physician	—6 to 13	
Office man	—12 to 4	

Here we have 6 per cent[10] of realtors scoring B— with raw scores from —24 to —46: but all negative scores should be indicative of not possessing interests of the occupation! One possible explanation of this paradox is that in some occupations certain members differ much more from the average than is the case in other occupations. This may be caused by poor sampling on our part, or it

[10] Here 71.1 per cent of realtors rate A; 9.1 per cent B+; 11.9 per cent B; 6.2 per cent B—; 1.2 per cent C+; and 0.4 per cent rate C.

may reflect the actual situation. It is rather easy to suspect the latter is true regarding realtors and farmers, for they are occupations entered by many people without any previous experience. But whatever explanation is advanced, the fact remains that a considerable minority in certain occupations score below zero. Consequently if a young man scores —24 raw score in the interests of realtor, we must simultaneously say he does not possess the interests of the occupation, having a negative score, and also that he has as much interest in that direction as 7.8 per cent of realtors who are presumed to be successful.

Chance scores.—The third consideration in interpreting interest scores is the possibility that a score may be obtained by chance. To ascertain what scores may be obtained in this way dice were thrown to determine the response for each item on the blank. A 1 or 2 signified like; a 3 or 4, indifference; and a 5 or 6, dislike. In this way forty blanks were marked and then scored on all the scales. The results are given in Table 8 where scores below C+, i.e., below a standard score of 25, are not shown. It is evident that a rating as low as C+ is not obtained by chance on the forest-service scale and, on the other hand, that there is a real possibility of obtaining a B or B+ and even an A rating on other scales (1 chance in 40 of obtaining an A rating on the printer and president scales). The worst situation in this respect exists with the realtor scale, where in 34 chances among 40 the rating will be B or B+. But there are fourteen occupations where there is no expectation of a B or higher rating by chance.[11]

One might expect the mean chance score and the raw zero score to coincide; but this is not the case. In one case among 34 occupational scales the former is 1.4 score higher than the latter, in two cases they coincide, but in the remaining 31 cases the mean chance score is lower than the raw zero score, the average difference amounting to 2.3 standard scores.

[11] Burnham and Crawford investigated the possibilities of obtaining occupational-interest scores by chance using 26 of the old scales. Among the 260 chance scores they found 1 B+, 9 B, and 8 B— ratings. Ten of these (1 B+, 7 B, and 2 B— ratings) occurred with the journalist scale. Evidently A and B ratings were not at all likely to occur by chance on the old scales, except in the case of the journalist scale. P. S. Burnham and A. B. Crawford, "The Vocational Interest and Personality Test Scores of a Pair of Dice," *Journal of Educational Psychology* (1935), **26**, 508–12.

It is evident from the last three columns of Table 8 that our criterion groups score far above chance scores. By actual count, 96 per cent of the men comprising the criterion groups score above zero raw score and 97 per cent score above the mean chance score.

In order that these chance scores may be taken into consideration in the interpretation of an occupational-interest score a shaded area is printed on the Report Blank (Figure 27, p. 421) opposite each occupation so as to mark off the sigma range of chance scores. Since the shaded area covers but 68 per cent of the distribution of chance scores, there are remaining 16 per cent above and below this area. If, however, a score is three or more standard scores removed from the shaded area, there is very little likelihood that it is the resultant of chance.

When the shaded area falls within the B— to B+ rating range, it emphasizes that some men supposedly successful in the occupation actually obtain minus raw scores and so on that basis do not have the interests of the occupation. If this minority of the criterion group are actually successfully engaged in the occupation, then the interest scale is faulty to that extent. In any case, scores within this range must be viewed with suspicion—they cannot be accepted as definite indicators of interest in the occupation.

The real significance of the shaded area on the Report Blank is that it calls attention not only to the $\pm\sigma$ range of chance scores but also to a range of scores in the neighborhood of zero raw scores. Scores in this range can be ignored to a large degree, since they indicate neither possession nor nonpossession of the occupational interests.

It can be argued that this third consideration of chance scores can be ignored and that the shaded area on the Report Blank should mark off a definite range above and below the raw zero score. Actually the shaded range based on chance scores approximates so closely such a shaded range about the raw zero score that for practical purposes the two can be used interchangeably. The counselor can explain the shaded area to a student by saying scores in that area are easily obtained by chance, or that they are close to zero, and in either case they indicate that the student neither possesses the interests of the occupation nor definitely does not possess them.

Low scores of C+ and especially C have been too much ig-

TABLE 8

CHANCE SCORES

Group	Scales	Distribution of 40 Chance Scores[a]					Mean Chance Standard Score	σ	Zero Raw Score of Criterion Group in Terms of Standard Score	Percentage of Criterion Group		
		C+ 25	B— 30	B 35	B+ 40	A 45 and Up				Scoring above Mean Chance Score	Scoring above Zero Score	Scoring above C+ Rating i.e., 25 Standard Score
I	Artist	17	11	1	..	..	27.4	3.6	30	97	96	98
	Psychologist	4	1	..	..	..	18.7	5.1	22	100	100	100
	Architect	10	2	..	..	..	21.7	4.5	25	99	99	99
	Physician	14	13	4	1	..	29.1	4.7	32	97	94	99
	Dentist	10	6	..	..	..	23.4	5.2	25	98	98	98
II	Mathematician	6	..	..	..	..	20.4	4.3	25	100	99	99
	Engineer	8	6	..	..	..	22.7	5.2	24	100	99	99
	Chemist	14	3	..	..	..	22.7	5.6	26	100	99	99
III	Production manager	13	14	..	1	..	27.6	4.4	31	98	96	99
IV	Aviator	14	7	1	..	..	25.2	5.7	27	98	98	98
	Farmer	4	13	20	3	..	34.6	3.5	36	92	88	98
	Carpenter	12	10	2	..	..	26.4	4.4	28	97	96	98
	Printer	7	16	10	6	1	34.7	4.7	38	92	90	99
	Mathematics-science teacher	22	10	4	..	..	28.3	3.8	31	97	96	99
	Policeman	17	18	4	1	..	30.5	3.5	31	95	95	99
	Forest service	..	..	..	..	..	11.7	5.0	16	100	99	99
V	YMCA physical director	4	..	..	..	..	20.0	4.1	24	99	99	99
	Personnel manager	10	6	1	..	..	23.5	5.4	27	99	99	99
	YMCA secretary	12	3	..	..	..	22.6	4.7	26	99	99	99
	Social science teacher	19	13	3	..	..	28.4	4.4	31	97	96	99
	City school superintendent	1	..	..	..	..	16.1	4.9	19	100	99	97
	Minister	5	1	..	..	..	20.2	4.4	24	99	98	98
VI	Musician	10	15	8	2	..	30.8	4.9	35	96	92	99
VII	Certified public accountant	9	5	..	..	..	22.2	5.1	26	99	98	98

[a] Only upper portion shown.

TABLE 8 (*Concluded*)

Group	Scales	Distribution of 40 Chance Scores[a]					Mean Chance Standard Score	σ	Zero Raw Score of Criterion Group in Terms of Standard Score	Percentage of Criterion Group		
		C+ 25	B— 30	B 35	B+ 40	A 45 and Up				Scoring above Mean Chance Score	Scoring above Zero Score	Scoring above C+ Rating i.e., 25 Standard Score
VIII	Accountant	12	7	2	..	..	25.7	5.1	28	99	98	99
	Office man	11	12	13	3	..	33.1	4.7	34	95	94	99
	Purchasing agent	18	8	2	..	..	26.1	4.5	28	99	99	99
	Banker	6	17	12	5	..	33.4	4.4	32	94	95	99
IX	Sales manager	18	8	..	..	..	26.1	4.0	29	98	97	99
	Realtor	..	6	16	18	..	38.3	3.4	40	86	80	99
	Life insurance	7	23	9	..	..	32.0	3.4	33	97	96	99
X	Advertising man	3	19	16	1	..	33.9	3.4	35	92	90	99
	Lawyer	19	13	7	..	..	30.3	3.6	30	97	97	99
	Author-journalist	..	18	21	1	..	34.9	2.4	36	90	88	99
XI	President	11	19	2	..	1	29.5	4.5	30	98	98	99
	Ave. 34 scales	..	..	..	..	..	26.7	6.0	29	96.9	95.8	99.1
	Group I	1	9	21	8	1	36.7	3.6	37	..	..	..
	Group II	9	11	8	2	..	29.5	6.2	31	..	..	..
	Group V	2	11	22	5	..	35.7	3.4	37	..	..	..
	Group VIII	8	14	11	7	..	34.1	4.6	35	..	..	..
	Group IX	..	7	18	14	1	38.2	3.1	38	..	..	..
	Group X	..	..	14	26	..	40.6	2.1	42	..	..	..
	IM	..	..	..	18	22	45.2	2.1	46	..	..	..
	MF	..	..	10	21	9	42.1	3.4	41	..	..	..
	OL	..	..	..	3	37	48.1	2.5	48	..	..	..

nored by counselors. Use of the shaded areas calls attention to the fact that when such low ratings fall definitely below the range of chance scores they assume real meaning, i.e., the individual very clearly does not possess the interests of those occupations. Students with such low scores in occupations they have long planned to enter are always quite impressed when it is pointed out that they not merely have a low score but also one that falls below

the realm of chance. Their record shows they most definitely do not have such interests.

Unlike most tests the score on a vocational interest scale is not a measure of how much interest is possessed. It indicates the chance that the individual's interests agree with those of the *average* successful man in the occupation (not with those of the most successful man). An A rating means the individual's interests agree very well with the interests of men in the occupation; a C rating means that there is no such agreement; whereas scores in the B-rating range indicate the degree of approximation to A or C ratings.

Summary.—If a score falls above or below the shaded area on the Report Blank, it may be accepted at face value, particularly if it falls three standard scores above or below the shaded area. In such cases its meaning is best expressed by the letter ratings as defined above.

If the score falls within the shaded area, it is to be viewed with suspicion. If scores on related occupations are significant, it may be accepted; otherwise not, unless there are other extenuating circumstances. One of these might be the evidence that the individual has the capacity to earn his living in the occupation but in a rather atypical manner.

Scores should never be viewed as conclusive. They should be considered as merely suggestive, taking into account all other information bearing upon one's vocational choice. Occupations rated A or B+ should be carefully considered before definitely deciding against them; occupations rated B— and C should be equally carefully considered before definitely deciding to enter them. Interpretation of scores is considered at greater length in chapter 17.

Chapter 6. Similarity of Interests

Interests have been investigated very largely for the purpose of differentiating one group from another. As a result, differences have been emphasized and similarities ignored. Actually groups agree far more than they disagree as to their interests.

The first part of this chapter may be summarized by the single statement: The interests of men from all walks of life are quite similar; so are the interests of men and women, and of boys and girls.

The possibility of scoring interests in terms of similarities instead of differences is considered in chapter 23.

SIMILARITY OF INTERESTS OF VARIOUS GROUPS

Age does not affect interests to any great degree, for the interests of 15-year-old boys, young men, and older men of 55 years are all remarkably alike. The correlation between the likes of 15- and 55-year-old men is .73—usually considered a high correlation (see Table 9). The correlation between the likes of 15- and

TABLE 9

SIMILARITY OF LIKES BETWEEN MEN OF DIFFERENT AGES*

	r
15 *vs.* 25 years of age	.82
15 *vs.* 55 years of age	.73
25 *vs.* 55 years of age	.88

* Based on percentages of likes for 400 items of 472 15-year-olds, 215 25-year-olds, and 151 55-year-olds.

25-year-old men is .82 and that between 25- and 55-year-olds is .88.[1] These coefficients mean that the rank-order of liking the 400 items on the blank is quite similar for all ages from 15 years on.

[1] The 15-, 25-, and 55-year-old groups are described on p. 715.

Correlation coefficients do not reveal, however, whether there is an increase or a decrease in liking all items as one grows older. This factor is considered below.

Sex affects interests to about the same degree as age, for the interests of men and women of the same age are also quite similar. The correlation is highest between college men and women, i.e., .74; it is slightly lower among adult men and women (.71); and it is lower still among boys and girls in high school (.61). (See Table 10.) The average for all these groups is .69, which approximates the coefficient of .73 between 15- and 55-year-old men.

TABLE 10

SIMILARITY OF LIKES BETWEEN THE TWO SEXES*

	r
Boys *vs.* Girls	.61
College men *vs.* College women	.74
Adult men *vs.* Adult women	.71
Above 3 groups of men *vs.* 3 groups of women	.69
Boys *vs.* Adult women	.48
Girls *vs.* Adult men	.59

* Based on percentages of likes of 114 boys and 114 girls aged 16.5 years, 154 men and 154 women college students aged 19.3 years, and 335 adult men and 335 women aged 38 years. See p. 217 for description of these groups used as criterion groups for the masculinity-femininity scale.

It is possible that greater differences in interests between men and women occur in early life, for Terman[2] reports a correlation of .24 ± .06 between the play interests of boys and girls in the age range of 6 to 16 years, in contrast to correlations of .83 ± .02 between two groups of boys, and between two groups of girls. And Lehman and Witty[3] found distinct differences between boys and girls regarding their amusements but reported there are practically no games which belong exclusively to one sex. The greatest difference occurs at from nine to ten years of age; thereafter the play interests grow more alike. We have no data regarding amusements for such early ages, but those in Table 17 indicate surprising agreement at age 16 (correlation of .65), which rises to .69 among college students and to .72 for adults.

[2] L. M. Terman *et al., Genetic Studies of Genius* (Stanford University Press, 1926), Vol. I, p. 403.

[3] H. C. Lehman and P. A. Witty, *The Psychology of Play Activities* (Barnes, 1927).

Rosander's[4] data on thirteen thousand males and females ranging in age from 16 to 24 years showed little or no difference in *attitude* between the sexes, or at varying ages, on certain scales but a real difference on other scales. Quite similar results would be reported by us if half a dozen or more interests were alone considered. It is quite likely if the responses were available from one hundred attitude scales and if they were handled as our data have been summarized that results similar to our own would appear, that is, that males and females from 15 years upward would agree fairly well.

Somewhat larger differences in interests are obtained when both sex and age are involved, for the correlation between the interests of girls and adult men is .59 and between the interests of boys and adult women is .48. This coefficient of .48 is the lowest we have found between any two groups of human beings, which means that boys and adult women differ more in their interests than any other two groups. Nevertheless the similarities among their interests exceed the differences.[5]

Differences in economic status are not particularly effective in influencing interests, for business and professional men earning $2,500 a year and better correlate .85 with working men of all classes and .84 with unskilled men (see Table 11). Officials of manufacturing plants agree amazingly (.89 to .94). The correlation is slightly lower between the president and the office employees (.86) and still lower between the president and the workmen (.78). But these are all high correlations, meaning that similarities are present to a remarkable degree.

All these data are based on averages of many individuals. If correlations were first calculated between pairs of individuals and then such correlations were summarized, the results would be considerably lower. But the data given do represent the relationships

[4] A. C. Rosander, "Age and Sex Patterns of Social Attitudes," *Journal of Educational Psychology* (1939), **30**, 481–96.

[5] A partial explanation for the lower correlation between boys and women than between girls and men is to be found in the mean scores of the four groups on the MF scale, i.e., boys, 52.5; women, 26.8; girls, 30.1; men, 47.7. The boys differ from the women by 25.5, which is appreciably greater than the difference between girls and men, i.e., 17.6.

between the averages of two groups. Rock[6] called attention to this situation in discussing the constancy value of items, saying:

While the mean constancy value for L's is only 74%, the correlation between the *average per cent* of initial L's and the *average per cent* of final L's for the 420 items is .98. The corresponding correlations for initial and final per cent I's and D's are .92 and .96 respectively, while the mean constancy values are .65 and .62. This is an indication that very high agreement for groups may occur, even when many individuals in the group are shifting their responses to many items.

TABLE 11

SIMILARITY OF LIKES BETWEEN MEN OF VARIOUS OCCUPATIONS

	r
Business and professional men *versus*	
Unskilled, semiskilled, and skilled workmen	.85
Unskilled workmen	.84
President of a manufacturing company *versus*	
Production manager	.94
Sales manager	.94
Personnel manager	.89
Office employees	.86
Unskilled, semiskilled, and skilled workmen	.78

	Versus Physician	*Versus* Life Insurance
Engineer	.86	.68
Production manager	.81	.78
Printer	.79	.69
Y.M.C.A. secretary	.72	.84
Musician	.82	.71
C.P.A.	.78	.77
Accountant	.75	.78
Life insurance salesman	.72	...
Lawyer	.83	.82

Similarity in terms of attitudes.—So far, likes alone have been considered. What happens if dislikes are also included in the calculations? Several correlations are given in Table 12 based upon likes alone and also upon attitudes, where attitude represents the difference in percentage of likes and dislikes.[7] The two sets of correlations agree almost exactly, there being on the average a greater correlation of .011 for attitudes than for likes. Similar results are shown in Table 13.

[6] R. T. Rock, Jr., "A Study of the Constancy of Responses to the Items of the Strong Vocational Interest Blank," read before the New York meeting of the American Psychological Association, 1934; abstract appears in *Psychological Bulletin* (1934), **31**, 705-6.

[7] See p. 652 for discussion of this measurement.

TABLE 12

SIMILARITY OF LIKES AND ATTITUDES OF CERTAIN GROUPS

(Attitudes = Percentage of Likes — Percentage of Dislikes)

	Correlation	
	Likes	Attitudes
Engineer *vs.* Chemist	.94	.95
Mathematician *vs.* Physicist	.93	.94
Artist *vs.* C.P.A.	.62	.63
City school superintendent *vs.* Realtor	.77	.79
Physicist *vs.* Life insurance salesman	.50	.52
Chemist *vs.* Life insurance salesman	.62	.64
Business and professional men earning $2,500 *vs.* Unskilled workmen	.84	.84
Average of seven comparisons	.75	.76

TABLE 13

SIMILARITY OF LIKES AND ATTITUDES OF THE TWO SEXES*

	Correlation	
	Likes	Attitudes
100 Occupations	.28	.36
36 School subjects	.26	.27
49 Amusements	.66	.69
48 Activities	.27	.28
47 Kinds of people	.96	.96
40 Order of preference of activities	.50	.49
40 Comparison between items	.82	.87
40 Present abilities	.95	.95
400 Entire blank	.69	.71

* Based on percentages of likes and dislikes of 603 men and 603 women from high-school, college, and adult life

SIMILARITY IN NUMBERS OF LIKING, INDIFFERENCE, AND DISLIKE RESPONSES

These data do not reveal the extent to which various groups like items as distinct from disliking them. That is, items might have the same rank order of preference in two groups of people, but one of the two groups might like all the items more often than the other group. Is there any evidence that certain groups like more items than other groups?

A small amount of data on this point is assembled in Table 14. The variations in percentage of likes, indifferences, and dislikes among twelve occupations are slight. Differences of 5.0 among likes, 2.7 among indifferences, and 4.4 among dislikes equal approximately three times the critical ratio of the difference. On this

basis there are no two groups which differ significantly as regards likes; there are quite a number of pairs that differ significantly as regards indifferences; and there are also several pairs that differ as regards dislikes. Printer has, for example, 5.1 per cent less indifferences than life insurance—a significant difference—but the two do not so differ with respect to likes and dislikes. But the differences between most of the pairs are not sufficient to be regarded as significant, and most differences that are statistically significant are not large enough to have real significance.

TABLE 14

AVERAGE PERCENTAGE OF LIKES, INDIFFERENCES, AND DISLIKES OF CERTAIN GROUPS OF MEN AND WOMEN

(Averages based on 400 Items)

N	Group	Average Age	Likes		Indifferences		Dislikes	
			Mean	Sigma	Mean	Sigma	Mean	Sigma
241	Architect	42.8	32.3	24.6	34.9	13.9	32.9	22.9
513	Engineer	43.9	33.8	25.0	34.4	13.2	31.9	23.1
216	Production manager	42.8	35.3	23.8	34.3	12.6	30.6	20.7
279	Printer	35.5	33.9	21.1	37.5	12.8	28.7	18.5
146	Personnel manager	41.0	36.9	23.4	35.4	13.2	27.8	20.5
250	Minister	42.6	37.6	25.7	36.2	14.5	26.3	20.9
250	Musician	32.6	33.1	21.5	37.0	12.8	29.8	18.8
354	Certified public accountant	37.3	34.5	23.7	33.9	12.7	31.5	20.7
338	Accountant	37.4	35.6	23.6	35.4	12.8	29.1	20.5
315	Life insurance salesman	39.9	36.0	23.9	32.4	11.9	31.8	21.6
251	Lawyer	39.2	33.4	23.9	32.8	12.5	33.7	21.1
169	President	48.0	34.2	23.1	32.9	12.6	32.8	21.6
114	Boys	16.6	29.3	18.6	39.1	12.3	31.5	16.5
114	Girls	16.4	31.1	20.5	36.5	11.7	32.7	19.0
154	College men	19.3	32.3	20.4	38.3	12.9	29.7	18.1
154	College women	19.3	35.0	22.2	32.5	12.7	32.5	21.2
335	Adult men	38.4	35.5	21.3	34.9	12.6	29.5	18.7
335	Adult women	38.4	35.3	24.0	33.1	12.9	31.7	20.8
472	Boys	15.5	27.8	18.6	34.9	11.0	37.3	18.4
215	Men	25.0	35.6	19.9	37.0	12.0	27.6	16.6
151	Older men	55.0	33.7	19.9	36.9	11.6	29.4	16.8

The factor of age, however, is associated with changes in the number of liking, indifference, and dislike responses among men. Fifteen-year-old boys have definitely more dislikes and fewer likes than older men. As men become older, the number of dislikes

decreases and the number of likes increases. Likes increase from 27.8 per cent at 15 years to 35.6 per cent at 25 years, and then decrease slightly to 33.7 per cent at 55 years of age. An explanation of these changes is attempted in chapter 13.

Table 15 shows how it is that the interests of the two sexes can agree so well and yet that differences between them are such that

TABLE 15

DIFFERENCES IN PERCENTAGE OF LIKES FOR INTEREST ITEMS BETWEEN MEN AND WOMEN

Difference in Percentage of Likes of Two Sexes	Percentage of 400 Items	Difference in Percentage of Likes of Two Sexes	Percentage of 400 Items
40	.5	−15	5.7
35	1.0	−20	5.2
30	1.4	−25	5.5
25	1.7	−30	2.1
20	3.1	−35	2.6
15	4.0	−40	1.2
10	7.4	−45	.7
5	11.7	−50	...
0	18.6	−55	...
−5	18.6	−60	...
−10	8.8	−65	.2

the two sexes can be differentiated surprisingly well on the MF scale (see chapter 11). For 37.2 per cent of items the two sexes agree within the range of ±5 per cent, and for 57.7 per cent of items the range is ±10 per cent. On the majority of items there is, then, genuine agreement. Consequently, when all the 400 items are considered, similarity of interests is found. When the majority of items are disregarded and emphasis is placed upon the remaining minority of items, differences between the sexes loom large.

PARTS OF THE BLANK CONSIDERED SEPARATELY

Granted that there is a high degree of similarity between the interests of all sorts of people when a long list of heterogeneous items is considered, does the same thing hold true for a list of homogeneous items, such as occupations, school subjects, amusements, people, etc.? Similarity as measured by correlation could be increased by using many popular items and many very unpopular items. In a sense this has been done in composing the items for

the blank, since there was a real effort to secure as wide a variety of items as possible. When, however, similarity is determined for only one type of item, such an influence can have less effect, particularly for items such as school subjects and amusements.

The data in Tables 16 to 18 show that the type of item has a real effect upon the degree of similarity of interests between various groups. All kinds of people agree amazingly well as to the kinds of people they like and dislike—the average of the fifteen correlations in the three tables is .95.

TABLE 16

SIMILARITY OF LIKES BETWEEN DIFFERENT AGES OF MEN BY PARTS OF BLANK*

	Items	Age Correlations		
		15 *vs.* 25 yrs.	15 *vs.* 55 yrs.	25 *vs.* 55 yrs.
100	Occupations	.75	.51	.63
36	School subjects	.66	.64	.84
49	Amusements	.83	.68	.89
48	Activities	.67	.53	.76
47	Kinds of people	.92	.88	.96
40	Order of preference of activities	.90	.86	.83
40	Comparison between two items	.86	.72	.83
40	Present abilities	.86	.74	.92
400	Entire blank	.82	.73	.88

* In most tables the data were carried to one more decimal place than reported. Means have been calculated from the more extended statistics.

TABLE 17

SIMILARITY OF LIKES BETWEEN THE TWO SEXES BY PARTS OF BLANK

(N = 114 pairs of high-school boys and girls, 154 pairs of college students, and 335 pairs of adults*)

	Items	Group Correlations				
		Boys *vs.* Girls	College Men *vs.* Women	Adult Men *vs.* Women	Boys *vs.* Adult Women	Girls *vs.* Adult Men
100	Occupations	.16	.56	.23	—.09	.14
36	School subjects	.27	.57	.22	—.07	.07
49	Amusements	.65	.69	.72	.44	.72
48	Activities	.05	.49	.30	—.01	.11
47	Kinds of people	.96	.92	.96	.90	.90
40	Order of preference of activities	.54	.58	.43	.41	.36
40	Comparison between two items	.78	.82	.84	.67	.62
40	Present abilities	.91	.91	.93	.85	.80
400	Entire blank	.61	.74	.71	.48	.59

* The six groups are described on page 217.

Part VIII of the *Vocational Interest Blank* asks the subject to rate himself as to whether or not he possesses certain traits or personality characteristics. The responses are not really expressions of interest but are closely related to interests. Such ratings are next to interests in people as regards the similarity of response of all manner of men and women. The average of fifteen correlations in Tables 16 to 18 is .88. The lowest correlation (.74) in this respect is between 15-year-old and 55-year-old men. Even unskilled to skilled workmen and presidents of manufacturing concerns rate themselves surprisingly alike, for their responses correlate .82.

TABLE 18

SIMILARITY OF LIKES BETWEEN CERTAIN OCCUPATIONS OF MEN BY PARTS OF BLANK

Items	Correlation between President and					Correlation between Business and Professional Men Earning $2,000 and	
	Production Manager	Sales Manager	Personnel Manager	Office Employees	Unskilled to Skilled	Unskilled to Skilled	Unskilled
100 Occupations	.86	.87	.75	.70	.55	.64	.63
36 School subjects	.91	.90	.87	.81	.65	.68	.85
49 Amusements	.96	.97	.95	.93	.81	.87	.68
48 Activities	.89	.87	.75	.88	.71	.80	.78
47 Kinds of people	.99	.99	.98	.97	.96	.97	.96
40 Order of preference of activities	.86	.75	.75	.76	.53	.64	.61
40 Comparison between two items	.91	.92	.85	.87	.77	.88	.85
40 Present abilities	.97	.97	.94	.89	.82	.89	.87
400 Entire blank	.94	.94	.89	.89	.78	.85	.84

Part VII—comparison of items—is third in the extent to which people react in similar fashion (average correlation of .81). Next in order are amusements, with an average correlation of .79. But here there is considerable variation in the amount of similarity of response among various contrasting groups. Men in general react alike to these items; but 15-year-old and 55-year-old men correlate only .68, as do business and professional men with unskilled

workmen. The two sexes agree to about that same degree except that 15-year-old boys and adult women correlate only .44. It is a little surprising, on the other hand, to find young girls and adult men agreeing about amusements to the extent of a correlation of .72.

The least agreement in interests is found with respect to occupational items in Part I of the Blank. But even here the average of fifteen correlations is .53, which is usually accepted as indicating considerable agreement. Employers and professional men agree with workmen .55 to .64 in this respect; 15-year-old boys agree to the extent of a correlation of .75 with 25-year-old men but to the extent of only .51 with 55-year-old men. This latter correlation is slightly lower than that between college men and women. Aside from this one comparison, the other four comparisons between the two sexes approach zero (.23 to —.09). Here at last we find no real similarity in interests between two groups of people (see Table 17).

About the same situation holds with respect to activity items (Part IV) and school subjects (Part II)—fairly good agreement among men regardless of age or economic condition but almost no agreement between the two sexes, except among college students, where we have correlations of .49 and .57, respectively. But when these same people are asked to choose between two activities (Part VII), their preferences agree surprisingly well, as given in the tables.

According to these figures young people by the age of fifteen have fixated their interests as regards types of people and they change scarcely at all from then on. Note the correlation of .88 between the interests of 15-year-old and 25-year-old men and the correlation of .90 between boys and adult women. Offhand these results imply that changes in attitudes of the public toward people, as in race prejudices and national antagonisms, will have to be effected early in life if they are to be successful. Our data do not preclude, however, another interpretation, namely, that these interests are the result of our present socio-economic environment, which causes a more or less common reaction from all. If such is the proper interpretation of the situation, then a change in the present social environment might produce a common change in

interests at all ages and in both sexes. Interests, we believe, are to a considerable extent the result of approval-disapproval and hence must be responsive to changes in public attitude. How far changes in interests may be produced by shifts in public attitude cannot be estimated from our data.

We are all familiar with cases of boys and girls who have interests not in harmony with their family and know that such interests are often very tenaciously held in the face of severe opposition. It is possible that interests are a more direct reflection of basic abilities than is true of attitudes, and hence are less responsive to environmental pressure. There are some extremely interesting problems to be investigated in this area.

The very high agreement among groups as to how they rate themselves (Part VIII of the Blank) has already been pointed out. There is less agreement regarding working conditions, yet even here similarity of interests is greater than dissimilarity. Some data on this type of interest are given in Table 19. In this case the subjects indicated three from among ten working conditions which they would most enjoy. These instructions have undoubtedly affected the data so that size of percentage should not be stressed but rather rank order of the ten working conditions. Rather casual inspection indicates rank-order agreement of about .70, the lowest being between president and artist (.44).

It is to be noted that the ten occupational groups do not rate these items in the same way. Skilled workmen consider "steadiness and permanence of work" most important, office workers put it second, and all others approximately third. "Opportunity for promotion" is rated most important by clerical workers, second by skilled workmen, and about sixth by professional men. The less an occupational group possesses one of these working conditions, the more it is valued, and vice versa. Thus, presidents, physicians, lawyers, and artists do not report to superiors to any real degree and so they do not wish for "courteous treatment from superiors" to anything like the extent that carpenters, sales managers, common laborers, musicians, and office workers do.

Possibly we can conclude that all men possess basically the same wants, or interests, and to about the same degree, but at any given time the wants which are least satisfied tend to be the strong-

TABLE 19

RELATIVE IMPORTANCE OF TEN WORKING CONDITIONS

*(Each individual checked the three items he considered most important. The figures give the percentage of each group who rated the item one of the three most important)**

Number of Cases	President 169	Production Manager 218	Sales Manager 233	Office Worker 326	Physician 336	Lawyer 251	Artist 232	Carpenter 185	Printer 258	Musician 252	Common Laborer 100	Average, 11 Groups
1. Freedom in working out one's own methods of doing the work	66	48	52	42	65	67	87	35	33	41	61	54
2. Opportunity to make use of all of one's knowledge and experience	68	52	49	40	76	72	75	38	34	40	36	53
3. Steadiness and permanence of work	30	41	34	45	35	33	35	65	64	58	29	43
4. Opportunity for promotion	34	50	57	63	21	30	11	49	41	41	51	41
5. Salary received for work	30	23	31	31	23	23	18	34	49	48	45	32
6. Certainty one's work will be judged by fair standards	20	30	21	21	22	31	39	15	16	13	21	23
7. Co-workers—congenial, competent, and adequate in number	38	25	28	22	26	17	14	10	27	25	11	22
8. Courteous treatment from superiors	5	18	12	18	6	9	9	24	18	20	25	15
9. Opportunity to ask questions and to consult about difficulties	9	7	6	10	19	20	8	13	8	6	15	11
10. Opportunity to understand just how one's superior expects work to be done	3	6	6	9	1	2	4	14	10	8	6	6

* From E. K. Strong, Jr., *Psychological Aspects of Business* (McGraw-Hill Book Co., 1938), p. 543.

est. If so, does this mean that improvements in working conditions will merely cause certain wants to be less desired and certain others to be more potent?

One additional table is included which stresses mean score as a measure of similarity rather than rank-order. In Table 20 we

TABLE 20

MEAN AND STANDARD DEVIATION OF LIKING, INDIFFERENCE AND DISLIKE PERCENTAGES OF 15-, 25-, AND 55-YEAR-OLD MEN*

Part	N	Like		Indifferent		Dislike	
		Average	Sigma	Average	Sigma	Average	Sigma
	472 15-YEAR-OLDS						
I Occupations	100	18.1	13.1	27.6	5.6	54.3	15.0
II School subjects	36	31.2	15.1	33.6	5.4	35.2	11.4
III Amusements	49	39.1	21.7	30.2	8.9	30.7	15.6
IV Activities	48	28.5	15.6	34.4	6.5	37.1	14.5
V People	47	22 5	20.9	39.2	11.6	38.4	18.7
VII Comparison of items.	40	35.8	19.5	36.9	13.2	27.3	14.9
VIII Present abilities	39	31.6	13.3	47.1	10.3	21.2	11.5
Total, including VI.	399[a]	27.8	18.6	34.9	11.0	37.3	18.4
	215 25-YEAR-OLDS						
I Occupations	100	27.0	12.1	37.8	6.1	35.2	12.5
II School subjects	36	45.6	13.6	36.2	8.7	18.2	7.5
III Amusements	49	46.3	21.4	33.9	12.2	19.8	16.0
IV Activities	48	40.7	14.4	35.3	8.1	24.0	11.5
V People	47	27.2	25.9	40.2	17.0	32.7	24.7
VII Comparison of items.	40	36.9	21.0	34.8	15.4	28.3	18.9
VIII Present abilities	39	42.9	23.4	35.8	16.5	21.3	16.1
Total	399	35.6	19.9	37.0	12.0	27.6	16.6
	151 55-YEAR-OLDS						
I Occupations	100	24.1	11.4	37.9	6.4	37.9	11.3
II School subjects	36	41.8	14.2	41.2	9.6	17.1	6.4
III Amusements	49	42.1	20.6	34.9	11.4	23.0	17.6
IV Activities	48	36.6	17.3	34.0	8.1	29.4	14.3
V People	47	26.4	26.4	39.3	15.4	34.3	23.3
VII Comparison of items.	40	36.6	19.5	34.1	14.3	29.4	18.0
VIII Present abilities	39	46.4	22.3	31.5	13.1	22.1	17.6
Total	399	33.7	19.9	36.9	11.6	29.4	16.8

* Part VI excluded, since the instructions require 30 per cent of items to be checked as likes, 40 per cent as indifferent, etc. Totals include Part VI, since they agreed so closely with totals without Part VI; thereby comparisons with other tables are made more easily.

[a] The last item, "Worry about mistakes," was omitted.

Chapter 7. Differentiation of Occupations

There are two somewhat different uses for the *Vocational Interest Blank.* The first is to differentiate and classify occupations in terms of interests; the second is to designate with which occupation, or occupations, a particular individual has interests most in harmony. There are consequently two measures of the validity of the test. The first is how well the test differentiates occupations; the second is how well individuals are assigned to occupations in which they succeed at least passably and at the same time find the work interesting.

Chapters 7 to 9 are primarily concerned with the first problem, but much of the material in these chapters is necessary for a thoroughgoing understanding of the second and primary use of the test. This chapter deals with differentiation of occupations. Chapter 8 considers the possibilities of classification of occupations in terms of interests. Chapter 9 discusses Group Scales based upon groups of occupations of similar interest. In chapters 21 and 22 there are outlined various procedures for differentiating and classifying skilled, semiskilled, and unskilled occupations, which cannot be satisfactorily handled with the technique used with occupations of the upper socio-economic levels.

The material in this chapter can very well be summarized in three sentences: Men engaged in occupations so far studied have a characteristic pattern of likes and dislikes that differentiates them from men in other occupations. The extent to which occupations may be differentiated varies greatly. Chemists and life insurance salesmen differ so greatly in their interests that it is easy to differentiate them on this basis; chemists and engineers, on the other hand, have so many interests in common that they cannot be distinguished from one another to any great extent.

DIFFERENTIATION OF MEN'S OCCUPATIONS

Tables 21 and 22 indicate how very successfully one occupation may be differentiated from other occupations on the basis of occupational-interest scales.

TABLE 21

DIFFERENTIATION OF ARTISTS FROM NINETEEN OTHER OCCUPATIONS BY USE OF THE ARTIST SCALE

(N = 100 in each group)

Occupation	Mean	Sigma	Difference between Means of Artist and Other Occupation	Critical Ratio of Difference of Means	Percentage of Overlapping	Percentage of Letter Ratings			r with Artist
						A	A and B+	A, B+, B and B—	
Artist	51.90	9.84	.....	....	..	76	88	98	...
Physician	33.48	10.52	18.42	12.8	37	9	23	69	.79
Mathematician	33.30	9.96	18.60	13.3	35	12	25	67	.61
Musician	33.18	12.18	18.72	11.9	40	18	28	62	.57
Advertiser	30.46	11.68	21.44	14.1	32	9	22	51	.41
Chemist	28.82	10.86	23.08	15.8	26	10	16	41	.44
Printer	26.46	10.00	25.44	18.2	20	4	8	35	.13
Minister	26.34	10.06	25.56	18.1	20	4	11	34	.26
Lawyer	25.98	9.48	25.92	18.9	19	2	6	33	.39
Farmer	23.96	9.76	27.94	20.1	15	4	5	26	.01
Carpenter	23.56	9.12	28.34	21.1	13	0	3	26	—.02
President	22.40	10.88	29.50	20.1	15	1	5	28	—.03
Certified public accountant	22.22	9.50	29.68	21.7	13	2	2	21	.00
Life insurance salesman	21.52	8.94	30.38	22.8	11	0	1	20	—.27
City school superintendent	20.34	9.20	31.56	23.4	10	0	2	18	—.13
Production manager	20.28	8.68	31.62	24.1	9	0	3	13	—.43
Policeman	19.36	9.66	32.54	23.6	10	1	2	17	—.38
Personnel	18.96	9.72	32.94	23.9	10	0	1	17	—.47
Banker	16.62	10.22	35.28	24.8	8	0	1	13	—.64
Accountant	16.78	9.32	35.12	25.8	7	1	1	10	—.74

One hundred artists taken from our criterion group[1] have a mean standard score on the artist scale of 51.9, whereas bankers, who score lowest of all in the interests of artists, average only

[1] Here and elsewhere when 100 or more cases are used to represent a larger group they have been so selected that their mean score and standard deviation are approximately equal to such measures of the larger sample. In this particular case the mean score differs more than usual from the mean of the entire criterion group.

16.6. Differences between means are given in Column 3 of Table 21 and in the next column these differences are expressed in terms of critical ratios. Since the smallest of these critical ratios is 11.9, it is evident that all 18 groups are differentiated significantly from artists by their mean scores on the artist scale.

TABLE 22

DIFFERENTIATION OF ACCOUNTANTS FROM NINETEEN OTHER OCCUPATIONS BY USE OF THE ACCOUNTANT SCORE

(N = 100 in each group)

Occupation	Mean	Sigma	Difference between Means of Accountant and Other Occupation	Critical Ratio of Difference of Means	Percentage of Overlapping	Percentage of Letter Ratings			r with Accountant
						A	A and B+	A, B+, B and B—	
Accountant	49.44	10.22	.....	....	..	73	84	95	...
Certified public accountant	42.60	10.22	6.78	4.7	74	44	66	87	.28
Banker	38.68	11.36	10.76	7.0	62	36	49	76	.48
Personnel	35.52	10.34	13.92	9.5	50	17	32	67	.46
Production manager	35.12	9.62	14.32	10.2	47	16	30	64	.45
Policeman	34.28	10.46	15.16	10.4	47	12	33	63	.33
Carpenter	32.66	10.98	16.78	11.2	43	15	27	60	.16
Printer	31.56	9.82	17.88	12.6	37	9	20	54	.12
President	30.70	11.62	18.74	12.1	39	11	24	47	—.06
City school superintendent	29.88	9.42	19.56	14.1	32	5	18	48	.12
Chemist	29.10	10.88	20.34	13.5	34	7	18	42	—.16
Mathematician	27.52	9.02	21.92	16.1	27	4	9	38	—.29
Musician	26.38	11.28	23.06	15.2	27	5	8	34	—.30
Farmer	26.04	9.78	23.40	16.6	26	1	7	40	—.03
Lawyer	25.90	10.10	23.53	16.3	26	4	10	31	—.42
Advertiser	25.28	10.78	24.16	16.3	27	5	7	29	—.39
Life insurance salesman	25.12	11.64	24.32	15.7	27	6	11	28	—.02
Minister	20.24	9.16	29.20	21.3	14	1	4	19	—.16
Physician	18.78	8.76	30.66	22.9	11	1	3	11	—.60
Artist	11.48	8.74	37.96	28.4	6	1	1	2	—.74

Data corresponding to those in Table 21 are given in Table 22 regarding scores on the accountant scale. In general the more nearly an occupational group scores like artist, the less it scores like accountant, and vice versa (rank correlation of —.78). Such relationships suggest that occupational interests might be classified on the basis of mean scores of the occupations on the various occu-

pational scales. This would call for the scoring of many thousands of blanks on all the scales—an amount of scoring that has not so far been considered feasible.

Table 22 exhibits a wider range of group means than Table 21, ranging from 49.4 for accountant and 42.6 for certified public accountant to 18.8 for physician and 11.5 for artist. In terms of critical ratios the differences in means from that of accountant range from 4.7 for certified public accountant to 38.0 for artist. All eighteen occupations differ significantly from accountant when scored on the accountant scale. These two examples are typical of data for each scale.

Overlapping of distributions.—Even when mean scores differ as greatly as these do, there is some overlapping between the distributions. Overlapping is expressed in two different ways in Table 21. In the fifth column is given the total overlapping, i.e., "the percentage of area common to the two distributions, which is, in other words, the percentage of scores made by one group which could be matched with scores in the other group."[2] Physicians, who score most like artists, overlap in scores by 37 per cent, whereas accountants and bankers overlap with artists by only 7 and 8 per cent, respectively. In Table 22 certified public accountants average only 6.8 standard scores below the mean of accountants and overlap in distribution by 74 per cent. At the other extreme are artists, who average 37.9 standard scores below accountants and overlap only 6 per cent.

Such overlapping is graphically depicted in Figure 3, where the distributions of scores of five occupational groups on the artist scale are shown. Here the overlapping can be ascertained by counting, if one wishes to do so. Percentages so obtained differ slightly from those given in Table 21, since the latter are obtained by a formula which presupposes normal distribution.[3]

[2] Overlapping here and elsewhere in this book means "the percentage of scores made by one group which could be matched with scores in the other group." The formula used is $\frac{Av_1 - Av_2}{\frac{1}{2}(\sigma_1 + \sigma_2)}$. The percentage of overlapping is obtained from Table 1 of J. W. Tilton's article, "The Measurement of Overlapping," *Journal of Educational Psychology* (1937), **28**, 656–62.

[3] Percentage of overlapping is a valuable measure, since it also affords a good measure of validity or prediction value of the procedure. See page 128, where it is utilized for this purpose.

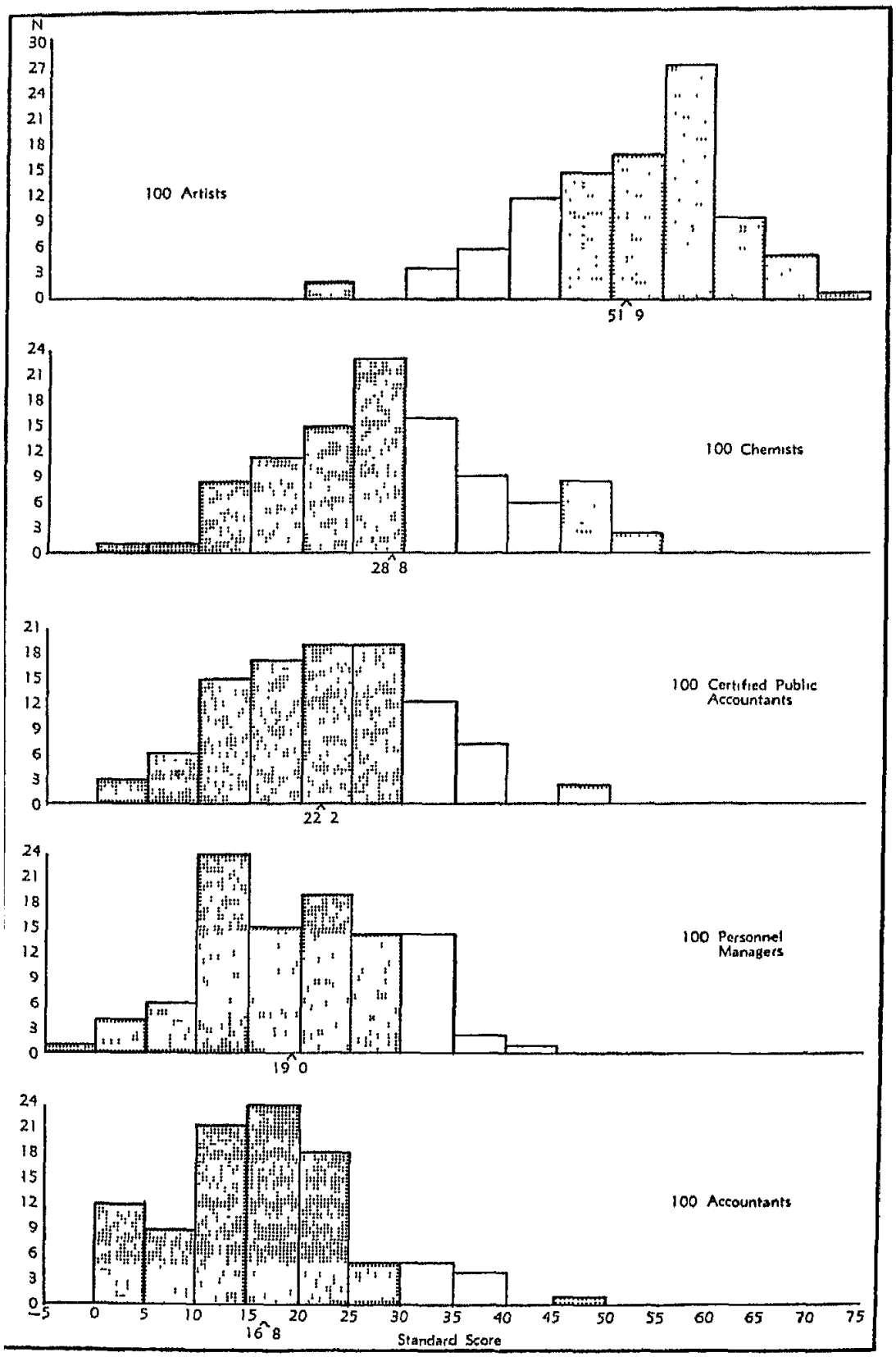


FIG. 3.—Distribution of standard scores of five occupations on Artist Scale.

Another and far more common way of expressing overlapping is to give the percentage of one group which equals or exceeds the mean or median of the other group. Thus in Figure 3, the 2 per cent of chemists and 0 per cent of the other three occupational groups equal or exceed the mean of artists. But this procedure does not describe the total situation as well as the preceding one.

A variation of this procedure, particularly applicable in this investigation, is to give the percentage of a group who rate A on an occupational scale. As the critical score for an A rating is at $-.5\sigma$ there should be 19.15 per cent greater overlapping in this case than when the mean is employed as a reference point. Such measures are given in Tables 21 and 22 not only in terms of A rating ($-.5\sigma$) but also in terms of A and B+ ratings combined (-1.0σ) and of A, B+, B, and B— ratings combined (-2.0σ). Evidently there are comparatively few men rating A as artists or accountants unless they are members of those occupations whose interests are somewhat similar to those of artists or accountants.

Homogeneity of the occupation.—The term "occupation" is used in most cases in this book as a short cut to the expression "interests of the men successfully engaged in the occupation." We are discussing not occupations, per se, but the interests of the men (or women) who are members of the occupation. Moreover it must be borne in mind that each occupation is to be defined in terms of the characteristics as given on page 694, where each criterion group is described. In other words the differentiation which is reported between occupations is a differentiation which is present after beginners, the easily discouraged, and the failures within three years have been eliminated.

Men may enter the real estate business with very little difficulty; their success or failure is influenced by many factors, some of which have little relationship to their personality and interests, as for example, family and business connections. Our data indicate there is less homogeneity among real estate men than among certain other occupations. Medical men, on the other hand, must go through a long period of preparation in their pre-medical and medical training, and those who are unable to do the work or haven't the necessary interest are weeded out. There results a fairly homogeneous group as far as interests go. The more thor-

oughgoing the weeding-out process is, and the more that process involves the elimination of men in terms of their personal attributes, the more homogeneous the occupational group becomes and the more surely it can be differentiated in terms of the interests of the members of the criterion groups.

DIFFERENTIATION OF OCCUPATIONS BY CORRELATION

In addition to differentiation of occupations in terms of differences in mean scores and in terms of overlapping it is possible in this investigation to differentiate them in terms of correlation. There is, of course, no way of correlating the data of two different groups of individuals, but it is possible to score one group on two different scales and to correlate these two sets of data. Each scale typifies the peculiar interests of an occupation. To ascertain the relationship between these occupational interests it would be sufficient to correlate the various scale weights. But no satisfactory method of doing this has been found and in consequence it is necessary to score a number of blanks on the various scales and then correlate the scores so obtained. We have employed in this connection the blanks of 285 students who were seniors at Stanford University in 1927.

Because the responses to any item are limited to like, indifference, or dislike, when one group responds with "like" a second group differing greatly from the first group must respond with "dislike." This necessarily results in the phenomenon set forth in Tables 21 and 22, where, as mean scores decline, the correlations between the two groups shift from 1.00 toward —1.00. In other words, the greater the difference in mean scores, the less the overlapping of distributions and the more the correlation between scales approaches —1.00.

In general this statement holds true; but there are exceptions. The relation of the interests of certified public accountants to those of accountants, as given in Table 22, is such an exception. The low correlation of .28 between them would suggest about half the overlapping and half the number of A ratings by C.P.A.'s in accounting that actually occur. An analysis of the data shows that C.P.A.'s who rate A in C.P.A. interest correlate about zero with accountant interest, their standard scores in the latter ranging from

12 to 62. The remainder of the C.P.A.'s correlate fairly highly with accountant interest. All in all, C.P.A.'s have many interests in common with accountants as shown by the high mean score, but there is very little relationship between rank order of scores in the two occupations. Consequently, neither mean scores nor correlation coefficients alone can tell the whole story of the relationship between the two groups.

Table 193 (facing p. 716) gives the coefficients of correlation between 38 occupations and occupational level, masculinity-femininity, interest maturity, and intelligence (*Thorndike Intelligence Examination for High School Graduates*).

There are 17 correlations above .80 and four correlations below —.80 among the 861 raw correlations in the table. The former pertain to pairs of occupations which are not differentiated to any great degree by the interest test; the latter pertain to pairs of occupations which are differentiated to a very great degree. The former consist of the following pairs of occupations.

Occupations	Group	Correlation
Physician—Dentist	I	.870
Artist—Architect	I	.849
Artist—Author-journalist	I and X	.839
Physicist—Chemist	II	.931
Physicist—Mathematician	II	.911
Physicist—Engineer	II	.854
Chemist—Engineer	II	.880
Chemist—Mathematician	II	.804
Farmer—Carpenter	IV	.834
Farmer—Forest service	IV	.800
Social science teacher—Y.M.C.A. secretary	V	.868
Social science teacher—City school superintendent	V	.815
Office worker—Accountant	VIII	.828
Life insurance salesman—Realtor	IX	.844
Life insurance salesman—Sales manager	IX	.821
Realtor—Sales manager	IX	.835
Y.M.C.A. secretary—Interest maturity (15 *vs.* 25)	..	.838

The four pairs of occupations which correlate below —.80 are:

Occupations	Group	Correlation
Realtor—Chemist		—.800
Life insurance salesman—Chemist	IX and II	—.841
Life insurance salesman—Physicist	IX and II	—.827
Printer—Occupational level		—.823

Constancy of intercorrelations.—The correlations given in Table 193 are based upon the blanks of 285 Stanford seniors

scored on the revised scales. It is of interest to know how these correlations compare with those obtained from the same blanks when scored on the old scales; also how age of the subjects may affect the correlations. Columns 4 and 5 of Table 23 give a sampling of such correlations—Column 4 is based on the old scales, Column 5 on the revised scales. The rank-order correlation between the two sets of correlations is .95. Columns 1, 2, 3, and 4 of the table present correlations based on the old scales of (1) high-school students,[4] (2) junior college students,[5] (3) college students admitted to University of Michigan Medical School,[6] and (4) college seniors. Casual inspection makes clear that all four sets of correlations agree very closely. The rank-order correlations between columns indicate that the greater the difference in age and educational status of the subjects, the lower is the correlation—thus high-school and college seniors correlate .73 and junior college students and college seniors correlate .89. The rank-order correlations between the five sets of data are:

Columns in Table 23	Original Scales		Original Scales	r
1–2	High school	*versus*	Junior college	.90
1–3	High school	*versus*	Medical student	.94
1–4	High school	*versus*	College senior	.73[a]
2–4	Junior college	*versus*	College senior	.89
3–4	Medical student	*versus*	College senior	.89
	Original Scales		Revised Scales	r
1–5	High school	*versus*	College senior	.66
2–5	Junior college	*versus*	College senior	.84
4–5	College senior	*versus*	College senior	.95[b]

[a] Carter *et al.* report a correlation f .77 based upon the whole table of 153 coefficients. Their high-school boys averaged 16.2 years of age.

[b] The average of 29 correlations between old and revised scales is .93 (see Table 197, p. 724).

It has been argued by several psychologists in personal conversation that the same correlation should be obtained from scores

[4] H. D. Carter, M. K. Pyles, and E. P. Bretnall, "A Comparative Study of Factors in Vocational Interest Scores of High-School Boys," *Journal of Educational Psychology* (1935), **26**, 81–98.

[5] K. W. Schlaudeman, unpublished study.

[6] P. S. Dwyer, "An Analysis of 19 Occupational Scores of the Strong Vocational Interest Test Given to 418 Students Entering the University of Michigan Medical School During the Years 1928, 1929, 1930," *Journal of Applied Psychology* (1938), **22**, 8–16.

on two interest scales regardless of the blanks used. The coefficients reported on page 115 and in Table 23 do not support this view. Age and possibly educational status seemingly are related to size of coefficient in the first set of correlations but not in the second.

TABLE 23

INTERCORRELATIONS BETWEEN OCCUPATIONS, BASED UPON FIVE GROUPS OF STUDENTS

Occupations	Old Scales				Revised Scales
	High-School Students	Junior College Students	Medical Students	College Seniors	College Seniors
	N=133	N=137	N=418	N=285	N=285
Engineer vs. Advertiser	—.12	—.35	—.23	—.59	—.55
Architect	.70	.61	.51	.58	.56
Artist	.39	.26	...	.12	.23
Certified public accountant	—.04	—.03	.12	—.04	—.17
Chemist	.83	.83	.73	.88	.88
Farmer	.64	.68	.54	.76	.63
Journalist	.00	—.19	—.11	—.39	—.14
Lawyer	.01	—.15	—.04	—.40	—.44
Life insurance	—.68	—.65	—.49	—.70	—.78
Minister	—.43	—.42	—.20	—.30	—.37
Personnel manager	—.26	—.26	—.16	—.17	—.31
Physician	.68	.64	.61	.53	.52
Psychologist	.59	.46	.38	.44	.40
Purchasing agent	.34	.29	.21	.27	.05
Real estate	—.25	—.38	—.27	—.54	—.64
Y.M.C.A. secretary	—.50	—.50	—.37	—.46	—.65
Lawyer vs. Advertiser	.83	.82	.70	.69	.74
Architect	.14	.09	.18	—.09	.05
Artist	.63	.55	...	.35	.39
Certified public accountant	.53	.47	.44	.44	.57
Chemist	—.29	—.27	—.21	—.36	—.31
Farmer	—.21	—.30	—.25	—.46	—.66
Journalist	.89	.86	.81	.81	.76
Life insurance	.37	.29	.28	.30	.47
Minister	—.45	—.22	—.03	.09	.26
Personnel manager	—.61	—.45	—.38	—.23	.06
Physician	.51	.36	.41	.15	.16
Psychologist	—.05	.10	.09	.07	.18
Purchasing agent	—.20	—.30	—.22	—.40	—.41
Real estate	.69	.51	.50	.35	.36
Y.M.C.A. secretary	—.58	—.46	—.44	—.17	.04

TABLE 23 (*Concluded*)

Occupations	Old Scales				Revised Scales
	High-School Students	Junior College Students	Medical Students	College Seniors	College Seniors
	N=133	N=137	N=418	N=285	N=285
Minister vs. Advertiser	—.61	—.28	—.40	—.07	.22
Architect	—.33	—.15	.01	.09	.12
Artist	—.58	—.12	...	.33	.26
Certified public accountant	—.15	—.14	—.02	.01	.06
Chemist	—.03	—.09	.10	—.04	—.10
Farmer	—.29	—.35	—.25	—.30	—.26
Journalist	—.64	—.28	—.27	.07	.26
Life insurance	.11	.04	—.11	—.04	.09
Personnel manager	.82	.67	.59	.26	.41
Physician	—.58	—.28	—.10	.14	.13
Psychologist	.05	.19	.32	.38	.47
Purchasing agent	—.17	—.40	—.36	—.54	—.69
Real estate	—.57	—.43	—.61	—.41	—.30
Y.M.C.A. secretary	.93	.85	.74	.60	.72

For the present we shall have to accept the following statement made to the writer by Dr. G. M. Kuznets:

The correlation between the weights given to items on two scales is going to influence the correlation between the total scores on the two scales. It is obvious that if the weights correlate unity the total scores will correlate unity in whatever populations that correlation is obtained, provided, of course, that some range of talent is in evidence. As the correlation between weights departs from unity, the correlation between total scores should reflect more and more the existing correlation between the scales in the populations used. With a zero correlation between weights, the correlation between total scores should reflect with complete freedom the correlation between the traits in question in the populations under consideration. It follows, then, that multiple-scoring techniques may impose upon the correlations between total scores on the scales, limits which are purely a function of the groups used in the standardization of the scales.

LIMITATIONS OF INTEREST TECHNIQUE IN DIFFERENTIATING OCCUPATIONS

The interest-test technique does not always differentiate occupations. The failure in many cases has presumably been due to faulty technique—too few cases in criterion groups being the most

common defect. There are, however, certain pairs of occupations which have interests so much in common that the two cannot be differentiated to any great degree. Four examples may be considered.

The first of these examples concerns the four engineering groups of civil, electrical, mechanical, and mining engineers.[7] Four scales were constructed contrasting the interests of these groups, respectively, with the unrevised men-in-general group. The correlations between the four scales were:

	Mechanical Engineer	Mining Engineer	Civil Engineer
Electrical engineer	.92	.96	.86
Mechanical engineer ...	...	.85	.84
Mining engineer	...	...	.86

Reference to the data on page 114 makes clear that eleven of the seventeen pairs of occupations are as poorly differentiated as mechanical and civil engineers. When overlapping is considered it appears that electrical and mechanical engineers are most similar to the other groups, that civil engineers come next, and that mining engineers differ most from the other three. In this case somewhat different conclusions are drawn from size of correlation and amount of overlapping. In the light of more recent developments it is possible that separate scales for the four groups of engineers might have more value than was thought possible when correlations in the eighties and nineties were not usually encountered.

In 1929 an attempt was made to differentiate Y.M.C.A. general secretaries, boys' secretaries, and physical directors. The outcome was the present scales for the first and third groups. The interests of boys' secretaries appeared, however, to be so similar to those of general secretaries as to preclude the possibility of differentiating the two sufficiently to be of any practical value.

A scale was developed for Life Insurance General Agents (managers) based on 204 cases, furnished by H. G. Kenagy, then of the Life Insurance Sales Research Bureau. When these blanks were scored on this scale and the scale for life insurance salesman, the

[7] E. K. Strong, Jr., "Interests of Engineers," *Personnel Journal* (1929), 7, 441–54.

correlation of .91 was obtained between the two sets of data. This indicated that these managers and salesmen could not be differentiated to any practical degree.

The same situation had occurred a few years earlier respecting salesmen of vacuum cleaners and district sales managers. Ratings of the two groups on their respective scales are given in Table 24,

TABLE 24

RATINGS OF VACUUM CLEANER SALESMEN AND DISTRICT SALES MANAGERS ON THEIR RESPECTIVE SCALES

Group	119 Vacuum Cleaner Salesman Scale			96 Vacuum Cleaner District Sales Manager Scale		
	A	B	C	A	B	C
Salesmen	76	21	3	33	37	30
District sales managers	69	27	4	75	19	6

where it is shown that district sales managers rate almost exactly like salesmen on the salesman scale but that salesmen rate considerably lower than district managers on the district-manager scale.

In all four of these cases it must be recognized that the occupations which could not be differentiated to any great degree are quite similar. District sales managers are usually selected from the salesmen making the best sales record, so that it is quite appropriate for the two groups to have about the same interests.

In these cases the technique has been to construct a scale for each group contrasting the interests of the group with men-in-general and then to score the blanks on the several scales. When the scores are quite similar, as in the cases indicated, it means that the groups are quite similar when contrasted with men-in-general. If, however, it is desired that the groups be differentiated as much as possible, the appropriate technique is to construct a scale contrasting the interests of the two groups themselves. This is the technique used in developing the masculinity-femininity, the interest maturity, and the occupational-level scales. By this procedure all similarities in interests of the two groups are eliminated from consideration and only differences between the groups are counted.

From a guidance point of view this second procedure is useful when a man knows he wants to be an engineer but cannot decide which type of engineering to enter, or when a personnel manager desires to promote one or more salesmen to the position of district manager. How useful the interest test may be in situations such as these remains to be determined.

Estes and Horn[8] constructed five scales based on the records of 615 upper-class engineering students at Northeastern University in which the interests of civil engineering students were contrasted

TABLE 25

THE PERCENTAGE DISTRIBUTION OF RATINGS OBTAINED BY 240 SUBJECTS NOT ENROLLED AND THOSE OF 240 SUBJECTS ENROLLED IN THE CURRICULUM FOR WHICH THEIR BLANKS HAVE BEEN SCORED

(After Estes and Horn)

Classification	A	B+	B	B—	C	Total
Men *not enrolled* in the curriculum for which scored	11	12	16	17.5	43.5	100
Men *enrolled* in the curriculum for which scored	75.5	13	6.5	2	3	100

with non-civil engineering students, and similarly for mechanical, electrical, chemical, and industrial engineering students. They report fairly good differentiation among the five engineering fields, as is shown in Table 25. The correlations between these scales and our engineering scale are:

	Correlation
Estes and Horn Civil engineering scale *vs.* Strong engineering scale	—.09
Estes and Horn Mechanical engineering scale *vs.* Strong engineering scale	.70
Estes and Horn Electrical engineering scale *vs.* Strong engineering scale	.71
Estes and Horn Chemical engineering scale *vs.* Strong engineering scale	—.27
Estes and Horn Industrial engineering scale *vs.* Strong engineering scale	—.63

Estes and Horn apparently expected a significant positive correlation between the first three of their scales and our scale, since the latter includes these three types of engineering, but state "it is

[8] S. G. Estes and D. Horn, "Interest Patterns as Related to Fields of Concentration among Engineering Students," *Journal of Psychology* (1939), 7, 29–36.

not to be expected that our scales for chemical and industrial engineering students should correlate highly with the engineering interest scale since representations from these engineering groups were not included in Strong's criterion group. Why the civil engineering scale should correlate less highly than the mechanical and electrical scales is not clear." The point is, of course, that Estes and Horn's scales are measuring different interests from ours. In their scales, all interests common to engineers are eliminated from consideration and only interests uncommon to one engineering group and the other four groups are weighted in the scoring. In our scale, all interests common to both engineers and men-in-general are eliminated and the uncommon interests affect the scores.

Scales, such as these five of Estes and Horn, may prove to be "serviceable in assisting the young engineering student to make the most appropriate choice of his field of concentration." The writer must, however, warn against too great reliance upon vocational guidance scales based upon records of students. Such a criterion lacks the validity which can be secured by basing scales upon men who have been successfully employed in the occupation for a number of years. Only in this way can the criterion be freed from a very considerable minority of college students who even as late as graduation believe they will spend their lives in the occupation only to change their minds during the next few years.

INTRODUCTION OF NEGATIVE CORRELATIONS

The data in chapter 6 emphasize that the interests of all groups correlate positively. But correlations between occupations given in Table 193 (facing p. 716) range between +.90 and —.90. From whence do these negative correlations come? Can such radically different coefficients both be correct?

Two such sets of coefficients of correlation are given in Table 26. The first set in this table are correlations between the likes of the two occupations for the 400 items on the blank. The second set are correlations between scores of 285 college seniors when scored on two occupational scales. When percentages of likes are correlated for engineer and chemist, the correlation of .94 is obtained; when scores on the two corresponding scales are correlated, the resulting coefficient is .88. Here we are dealing with

two occupations with very similar responses. In the next comparison artists and C.P.A.'s differ somewhat more in their likes than do engineers and chemists: correlation between percentages of likes on 400 items is .62, but between scores on the two scales it is zero. In the last comparison a correlation of .50 becomes —.83.

TABLE 26

COMPARISON OF TWO SETS OF CORRELATIONS MEASURING RELATIONSHIP BETWEEN OCCUPATIONAL INTERESTS

	Correlation between Mean Likes of 400 Items of Two Occupations[a]	Correlation between Scores of 285 Seniors on Two Occupational Scales
Engineer *vs.* Chemist	.94	.88
Mathematician *vs.* Physicist	.93	.91
Artist *vs.* C.P.A.	.62	.00
City school superintendent *vs.* Realtor	.77	.00
Physicist *vs.* Life insurance salesman	.50	—.83
Chemist *vs.* Life insurance salesman	.62	—.84

[a] From Table 12, p. 95.

The table well illustrates the fact that negative correlations are introduced by a scoring system in which the interests of an occupation are contrasted with the interests of a men-in-general group.

If a foot rule is placed below the letters

A B C D E

so that the zero end of the ruler is beneath A, then B is one-half inch away, C one and one-half inches away, etc. But if another foot rule which is graduated in inches to the right and left of a midpoint is placed under these five letters so that the zero point is under C then A is —1½ inches away and E is +1 inch away. There is no change in the position of the five letters, but their positions are indicated by only plus numbers in the first case and by both plus and minus numbers in the second case.

Calculating weights for occupations which have been compared with a men-in-general group is comparable to using a ruler with a zero in the middle. The resulting weights must be both plus and minus and in equal degree, if the men-in-general group is an aver-

age of the occupations studied. Consider the responses of artist and carpenter to liking to be an actor (see p. 73). Forty per cent of artists so respond and the item is given a weight of 2, since 40 per cent is greater than the 21 per cent for men-in-general; while only 11 per cent of carpenters so respond and the item is given a weight of —1 on the carpenter scale, since here 11 per cent is less than the 21 per cent of men-in-general. Here the same response receives a plus weight on one scale and a negative weight on the other scale, thereby causing a negative correlation as far as this item is concerned.

The plus and negative correlations in the second column of Table 26 indicate that the occupations are located, respectively, on the same side or on opposite sides of the men-in-general group. The correlation of —.83 between physicists and life insurance means that physicists differ in their interests in the opposite direction from men-in-general from that of life insurance men, whereas the correlation of .50 tells us that when all responses of both occupations are considered their interests are much alike.

A correlation of +1.00 means complete agreement of rank-order between two sets of data, and a coefficient of —1.00 means the two rank-orders are reversed. This meaning applies to our correlation coefficients based on percentage of likes. But this typical meaning of correlation does not apply to coefficients based on differential interest scores. Plus coefficients mean that the two occupations both differ from men-in-general in the same general direction; minus coefficients mean that the two occupations differ in opposite directions from the men-in-general group. In the latter case a correlation of —.80 does not mean that what one group likes the other dislikes, that their interests are reversed. In differential scoring the correlation coefficients indicate *direction* from the point of reference. Substitute a new point of reference, and the correlations will be greatly changed.

We shall reserve for chapter 21 further discussion of this topic. At the moment let us keep clearly in mind that the two sets of correlations given above are equally true even though they differ greatly. When liking for items of two occupations is considered, the correlation is a high positive one, for all groups agree in their interests to a large degree. When occupational scales are con-

structed in terms of differences, the similarities have been largely ignored and naturally the differences are emphasized. Furthermore, the process of emphasizing differences introduces negative correlations.

DIFFERENTIATION OF WOMEN'S OCCUPATIONS

Table 27 gives the distribution of scores of 200 women nurses on the seventeen occupational scales for women. These nurses score on the average 12 standard scores higher on their own scale than on that for office worker, and 37 standard scores higher than on that for life insurance saleswoman. The range of critical ratios of the differences is from 12.5 to 39.2. The percentage of total overlapping ranges from 53.0 to 4.9; details regarding the overlapping are given in the table.

Table 27 differs from Tables 21 and 22 in that here the same individuals are scored on different scales, whereas in the earlier tables different occupations are scored on the same scale. In all three tables there is unmistakable evidence that occupations of both men and women can be differentiated with the interest test.

In order to show the relationship between scores on the various occupational scales, Figure 4 is included. The ten nurses scoring highest on that scale are numbered 1 to 10 and they are plotted not only on the nurse scale but on six other scales. Similarly, the ten nurses scoring average on the nurse scale are numbered 11 to 20 and the ten nurses scoring lowest in nursing interest are numbered 21 to 30. Nurse 1 obtains an A rating in Nurse, B+ in Social science teacher, B in Mathematics-science teacher, and C on the remaining four scales. Nurse 30 obtains an A rating in Librarian, B— in Physician and English teacher, and C on the remaining four scales, including that of Nurse.

This figure illustrates what has already been pointed out above, namely, that decreases in mean scores are not always accompanied by corresponding shift from plus 1.00 toward minus 1.00 correlation. Nurses score fourth highest on the librarian scale (28.7), but the correlation between nurses and librarians is —.74, whereas nurses have the sixth highest mean score (23.3) on the social science teacher's scale with a correlation of .08.

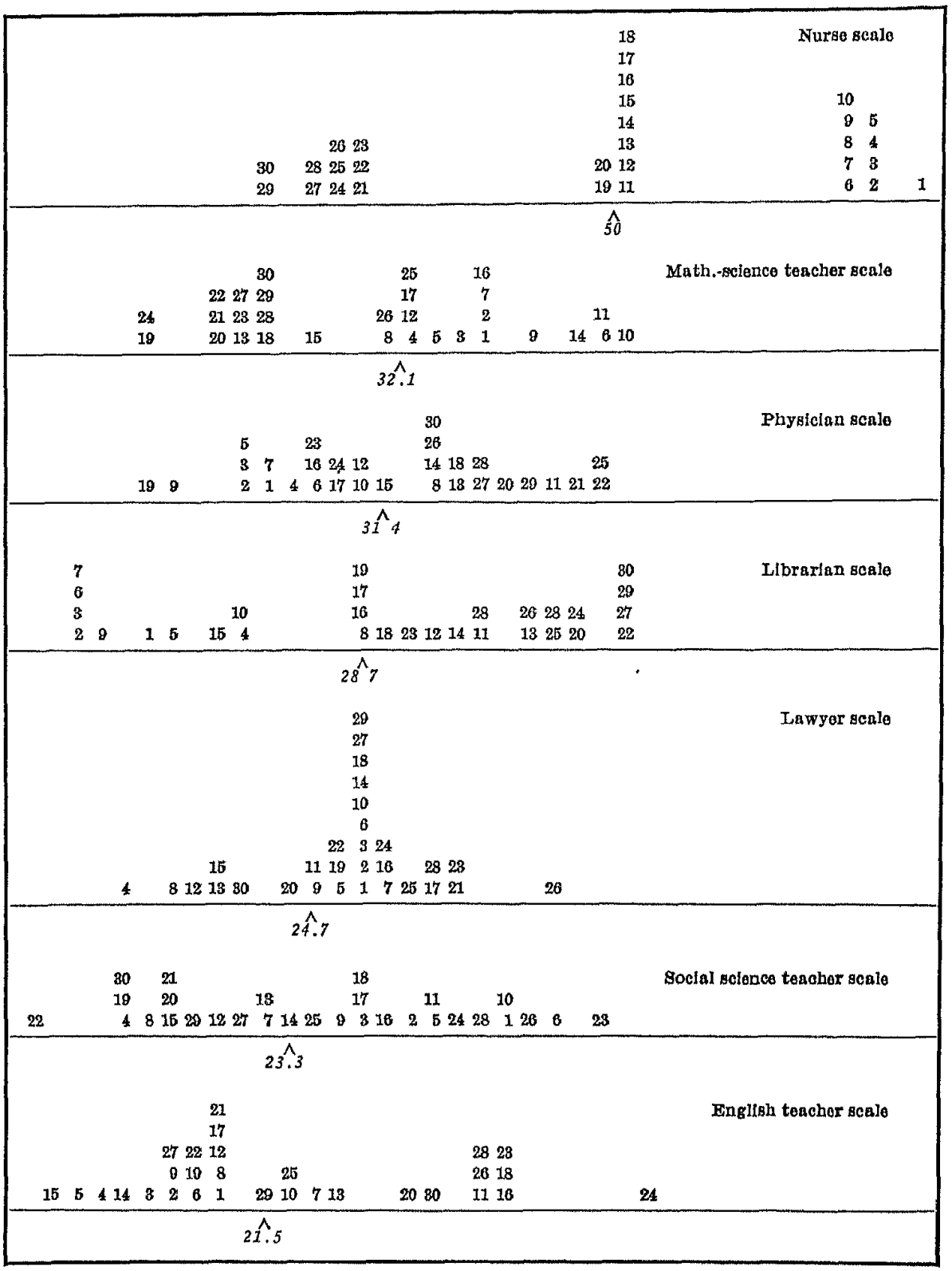


FIG. 4.—Distribution of 10 nurses scoring highest on Nurse Scale, also 10 nurses scoring average and 10 scoring lowest on Nurse Scale; together with distributions of these 30 nurses on six other scales.

TABLE 27

DISTRIBUTION OF STANDARD SCORES OF 200 WOMEN NURSES ON 17 OCCUPATIONAL SCALES

Standard Score	Rating	Nurse	Office Worker	Housewife	Stenographer-Secretary	Dentist	Math-Science Teacher	Physician	Social Worker	Artist	Librarian	Teacher in General	Author	Lawyer	Social Science Teacher	YWCA Secretary	English Teacher	Life Insurance Saleswoman
70.....	A	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
65.....	A	14	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
60.....	A	31	1	1	3	..	1	1	..	..	..	1	..	..	..	..	..	..
55.....	A	30	11	12	9	1	2	1	2	1	..	1	..	1	1	..	..	..
50.....	A	41	19	17	16	2	4	4	6	5	4	3	2	1	1	..	3	..
45.....	A	41	25	27	29	11	19	13	7	8	8	13	5	3	7	1	4	..
40.....	B+	18	48	39	34	26	14	22	19	24	15	13	11	13	16	7	6	2
35.....	B	12	35	38	29	38	45	33	28	31	28	20	26	12	21	19	16	3
30.....	B—	5	30	30	37	44	30	32	35	26	48	26	32	24	16	29	16	4
25.....	C+	5	25	22	20	40	33	39	36	29	22	35	34	37	27	29	26	18
20.....	C	1	6	11	16	21	23	28	35	33	27	30	30	43	22	34	31	29
15.....	C	..	..	2	6	9	18	17	15	16	27	27	20	35	29	35	38	39
10.....	C	..	..	1	1	5	8	8	10	14	12	20	17	17	28	20	29	40
5.....	C	..	..	..	..	2	3	1	7	10	7	7	17	13	18	16	18	39
0.....	C	..	..	..	..	1	..	1	..	2	2	4	6	1	8	8	8	21
—5....	C	..	..	..	..	..	..	..	..	1	..	..	..	..	6	2	3	3
—10....	C	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	2
—15....	C	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..
Mean ..	..	52.0	40.2	39.4	38.4	32.3	32.1	31.4	29.9	29.0	28.7	27.3	25.7	24.7	23.3	22.8	21.5	14.9
Sigma.	..	9.8	9.0	9.8	10.5	9.1	10.7	10.3	10.6	11.8	10.7	11.8	11.3	10.0	13.1	10.5	11.9	9.1
Critical Ratio	..	....	12.5	12.9	13.4	20.8	19.4	20.5	21.7	21.2	22.7	22.8	24.9	27.6	24.8	28.8	28.0	39.2
Percentage Overlapping	..	....	53.0	52.0	50.3	29.7	33.2	30.5	27.9	28.7	25.6	25.3	21.3	16.8	21.0	15.0	16.0	4.9
r with Nurse..	..	....	.55	.59	.57	.48	.42	—.19	—.26	—.48	—.74	—.06	—.68	—.19	.08	.16	—.31	—.26

Intercorrelations between women's occupations.—Table 194, page 720, gives the coefficients of correlation between 18 occupations of women, also the correlations between these 18 occupations and masculinity-femininity. There are only four cases among 171 where the correlation exceeds .80, i.e., between author and artist (.85), office worker and stenographer (.90), office worker and housewife (.84), and elementary school teacher and housewife (.80). The one correlation less than —.80 is that between author and office worker (—.81).

Conflicting data respecting differentiations of women's occupations.—Hogg[9] developed seven occupational scales for women, based on approximately 60 cases each, using Cowdery's revision of Freyd's blank.[10] She obtained good differentiation between the seven occupations but not as great differentiation as obtained by Cowdery or the writer using the same blank for men. With the exception of author the occupations studied by her overlap considerably according to our present data. She explained the lesser differentiation among women on the ground that "women work not for love of the work itself, but to be busy," that possibly "women in the various occupations are alike; that their interests are similar in that they all want to do something; that they are in the particular occupations which offered the least resistance for them to satisfy the desire to do something; to be modern women."

Manson[11] constructed ten occupational scales based on responses to only 160 occupational items. The average reliability was .896. But the scales did not differentiate the occupational groups from one another as well as did our earlier men's scales. Table 28 gives an example of this. Although the correlations range from .92 to —.95 the overlapping ranges from 72 to 53 per cent. Among the seventy measures of overlapping in Tables 21, 22, and 27, there are only two cases of as large overlapping as 53 per cent. In other

[9] M. I. Hogg, "Occupational Interests of Women," *Personnel Journal* (1928), **6**, 331–37.

[10] See p. 608.

[11] G. E. Manson, "Occupational Interests and Personality Requirements of Women in Business and the Professions," *Michigan Business Studies* (1931), **3**, No. 3. Manson's scales were developed from data previously accumulated for a survey of women in business and the professions. Unfortunately she did not publish intercorrelations between scales, mean scores of occupations, or percentages of overlapping as used by us.

words, the best differentiation in Table 28 of Manson's data is poorer than 68 out of 70 cases among our data.[12]

TABLE 28

CORRELATION AND OVERLAPPING WITH HIGH-SCHOOL TEACHERS AND NINE OTHER WOMEN'S OCCUPATIONS WITH USE OF MANSON'S SCALES

Occupation	Correlation with High-School Teacher[a]	Percentage of Overlapping (By Actual Count)[b]
Grade-school teacher	.92	72
Private secretary	.68	57
Stenographer	.30	59
Office manager	—.24	55
Nurse	—.45	63
Office clerk	—.64	59
Bookkeeper	—.70	53
Sales proprietor	—.92	60
Retail saleswoman	—.95	56

[a] Correlations reported by I. R. Berman, J. G. Darley, and D. G. Paterson, "Vocational Interest Scales," *University of Minnesota Employment Stabilization Research Institute* (1934), Vol. 3, No 5, Table XIX

[b] Calculated by the writer from Manson's Chart I, pp. 318–19. The necessary data are not available to determine percentage of overlapping as in the preceding tables. The two procedures would differ considerably, as Manson's distributions are not normal.

Berman, Darley, and Paterson reported on their use of our unrevised scales for men and Manson's scales for women, as follows.

These data suggest that women in these occupations are not particularly homogeneous in their interests, a point that Manson clearly recognized . . . . it is probable that the business and professional club women [Manson's criterion groups] are not so professionalized as Strong's criterion groups. In other words, professionalization among men may indicate far greater specialization than among women. . . . . It is apparent that a surprisingly large percentage of "women in general" secure A ratings in all the Manson scoring keys. This result is in striking contrast to corresponding data for men. Here again, the evidence indicates the non-specificity of occupational interest patterns for women—women's interests tend to be universalized. Manson recognized this problem and accounts for the results on the basis of one or more of the following reasons: (1) Men in Strong's criterion groups were more rigidly selected in terms of "professional standards." (2) The Manson occupational scoring keys were developed for analyzing women's interests in occupations that are much less specialized than the occupations studied by Strong. (3) The Manson test

[12] Differences in methods of calculating overlapping in the two investigations may account for some of the difference in results, but such differences will not account for the large overlapping between occupations in Table 28 which correlate negatively with each other.

is much briefer than Strong's and is confined to occupational items only. (4) There may be a genuine sex difference in occupational interest such that men's interests are stronger and more specific, whereas women's occupational interests are weaker and more general.[18]

The data in Tables 21 and 22 for men and 27 for women do not reveal any essential difference in differentiating within the two sexes occupationally speaking. But this does not mean that men and women can be equally well differentiated with respect to all occupations. In fact, the writer's hunch is that it will be found that men can be better differentiated respecting a larger number of occupations than can women. The primary reason for this belief is that the interest technique necessitates a fairly homogeneous criterion group. At the present time far too many women enter an occupation as a stop-gap until marriage. Consequently they take a job because it is convenient, not because they intend to continue in it indefinitely. The result is that most occupations contain a considerable number of women who would not be there if they had selected an occupational career as men do. Any sampling of such occupations gives a rather heterogeneous group of women. Occupational scales based on such criterion groups cannot be expected to differentiate very well.

There are two essential differences between Manson's scales and our own—differences that can very well explain the differences in results. Manson's scales apply to those occupations women enter as a stop-gap; our scales apply to occupations of a more professional sort, such as, author, librarian, artist, physician, dentist, lawyer, and life insurance, as well as some occupations common to both sets of scales. Hence, our criterion groups can be far more homogeneous than Manson's. Second, Manson's women-in-general group was based on a very large number of women, but the great majority were drawn from occupations women enter in large numbers without much regard to the requirements. From our experience such a women-in-general group will not give good results; see page 554. When we tried out such a point of reference our scales differentiated occupations very poorly. Our present women-in-

[18] I. R. Berman, J. G. Darley, and D. G. Paterson, "Vocational Interest Scales," *University of Minnesota Employment Stabilization Research Institute* (1934), **3**, No. 5, pp. 24–25.

general group is composed of representatives of the occupations as listed on page 714. Our present scales, consequently, differentiate the more professional type of women from one another. But we cannot tell whether or not it is possible to differentiate average women from one another respecting the occupations the great majority of women enter. There is need for extensive research on this problem.

VALIDITY OF VOCATIONAL INTEREST TEST

The development of most psychological tests has been fraught with much difficulty because there is no available, definite, measurable criterion. This is true even of the intelligence test—the most widely used of all tests. The widely repeated definition of intelligence, that "it is that which an intelligence test measures," amply expresses the situation. If we had attempted to develop interest scales for vocational guidance purposes or to differentiate between superior and inferior members of an occupation, we should have had our hands full trying to establish criteria to check against. We dodged all such difficulties—and they are legion—by setting up as our objective the mere task of differentiating occupations. This gave us specific criteria with which to work.

We have assumed that anyone known by his associates as a member of an occupation for at least three years is a member of that occupation. Superior men, average men, and inferior men are all included, so long as they and others consider they belong. There is little or no difficulty in identifying engineers as engineers and not as lawyers or as ministers. Only when finer distinctions are required is there difficulty in establishing criteria, as for example in differentiating between electrical and mechanical engineers or between the subgroups in banking.

Measures of validity.—Fryer[14] has listed four measures of validity in this connection: (1) Tryout upon a new, or control, group; (2) comparison of differences in interest scores of different groups; (3) correlation with extraneous criteria, such as (*a*) mechanical operations, tools owned, father's rating on a mechanical occupa-

[14] D. Fryer, "Validating Measures of Interest," *Personnel Journal* (1932), **11**, 103–10.

tional scale, mechanical occupational preferences with which to correlate scores on a mechanical-interest scale,[15] and (*b*) occupational plans of students;[16] and (4) validation through use.

When the original criterion group is small, tryout upon a new, or control, group has given much lower correlations. Fryer reached the conclusion that an original criterion group of 250 cases is probably sufficient. This point is discussed in chapter 24, where the conclusion is reached that satisfactory results with the *Vocational Interest Blank* are secured with samples of that size but greater validity can be obtained with still larger samples of 400 and possibly 500 cases. In other words, a tryout upon a new group is a valuable way of validating a test but it is apparently not necessary with an interest test when the criterion group upon which the scale is based consists of several hundred cases.

Extraneous criteria have not been used by the writer in validating the interest scales, because none of them can equal good samples of the occupations which are to be contrasted. If a test differentiates, for example, engineers and lawyers, it does so and that's the answer. Extraneous criteria may very well be employed in establishing the validity of vocational counseling, because there is no really satisfactory criterion to check against and any and all data suggesting successful prediction are needed.

Fryer does not make clear what he means by validation through use. Presumably he has in mind the use of interest tests with young people and follow-ups to determine how well the early diagnosis agrees with subsequent behavior; see chapter 16.

The primary measure of validity in this connection is the second one stated by Fryer, namely, "comparison of differences in interest scores of different groups." In many respects percentage of overlapping is a better measure of validity than difference in mean scores of the two groups. Fryer uses overlapping himself[17] in discussing the validity of the personnel scale—the first scale to be

[15] Used by R. M. Hubbard, "Measurement of Mechanical Interests," *Pedagogical Seminary and Journal of Genetic Psychology* (1928), **35**, 229–54.

[16] Used by E. K. Strong, Jr., "Diagnostic Value of Vocational Interest Test," *Educational Record* (1929), **10**, 59–68, and "Interests of Engineers," *Personnel Journal* (1929), **7**, 441–54.

[17] D. Fryer, *The Measurement of Interests* (Henry Holt and Co., 1931), pp. 122–25.

discussed in writing by the author.[18] Manson also uses overlapping, stating, "the effectiveness of the test varies inversely with the amount of overlapping found between the interests of the several groups of women when they are measured by the ten occupational scales."[19] The artist scale is then not so effective in differentiating artists from musicians, since there is 40 per cent overlapping, as it is in differentiating artists from accountants where there is only 7 per cent overlapping (Table 21, p. 108). But the true validity of the artist scale remains unknown even when such data are available, for no one knows today how many artists are also musicians and accountants or—what is more to the point here—how many artists and musicians actually have approximately similar interests and how many artists and accountants lack agreement. For if 40 per cent of musicians and artists actually have similar interests, then the artist scale has 100 per cent validity, when with its use it is found that there is 40 per cent overlapping between the two occupations. Overlapping can be used as a measure of validity of a test only when we bear in mind that the overlapping which actually exists, not 0 per cent overlapping, must be viewed as the criterion of perfect validity and that more or less overlapping than the true amount represents in both cases a lesser degree of validity.

This chapter has amply demonstrated that the vocational-interest scales differentiate occupations. There is no way at present, however, of expressing the degree of their effectiveness in this respect, for we do not know how much differentiation actually exists between any two groups of individuals. There is no question that the summary sentence at the beginning of the chapter is true—men engaged in any occupation so far studied have characteristic interests that differentiate them from other occupations. There is furthermore no question that the vocational-interest scales are valid instruments for measuring such patterns of interests and for differentiating between occupations.

[18] E. K. Strong, Jr., "An Interest Test for Personnel Managers," and "Interest Analysis of Personnel Managers," *Journal of Personnel Research* (1926), **5**, 194–203, and 235–42.

[19] G. E. Manson, *op. cit.*, p. 316.

Chapter 8. Classification of Occupations

Several questions come to mind when one is confronted with a table of intercorrelations between occupations, such as Table 193 (facing p. 716). Are all these occupations equally different from one another or do they quite naturally fall into a number of groups? Second, is there any way of picturing all of the 703 intercorrelations between 38 occupations so that the relationships may be more easily grasped? When so pictured, will an appropriate grouping of occupations be self-evident? Third, is it possible to express all these relationships in terms of a few independent factors? Fourth, if so, might it be possible to express occupational interests as combinations of 3, 4, 5, or more factors, thus scoring an interest test only 3, 4, 5, or more times instead of once for each separate scale? Fifth, if there are a few such factors, is it possible to identify them?

The first three of these questions are answered in this chapter, which is concerned with the major problem of classifying occupations on the basis of the interests possessed by men engaged in the occupations. The fourth question is discussed in the following chapter. The fifth question is reserved for chapter 14.

CLASSIFICATION BASED ON CORRELATION

Casual inspection of the correlations[1] between 38 occupations in Table 193 suggests immediately that occupations can be classified into groups on the basis of the interests of the men engaged therein. Thus mathematicians and physicists, correlating .91, are naturally grouped together. Chemists would similarly be classified with them, since chemists correlate .80 with mathematicians and .93 with physicists. Several other groupings of this sort are quickly

[1] Correlation between two occupations is based on the scores of 285 college seniors on the two occupational scales.

detected. But there remain other occupations which are not so easily classified.

The objective in classifying occupations on the basis of intercorrelations is to obtain the maximum average correlation between members of a group and the minimum average correlation with all other groups. It has appeared to us that unless an occupation correlated on the average of .60 with the other members of a group it should not be included. If we had data on a much larger number of occupations we would probably raise this minimum standard of .60. A still better requirement would be that each occupation should correlate at least .60 with all other members of a group. But this requirement forces too many occupations to be grouped alone to be feasible at present.

We have had in mind still another standard for membership in a group, namely, that occupations having no obvious connection in everyday life should not be included in the same group. To ignore this third criterion might result in occupational groups which were useless as far as guidance and selection are concerned. So far there has been no real need for this last requirement, for all groups based on the other standards have conformed also to this one with two possible exceptions, i.e., the inclusion of artist in Group I and the inclusion of mathematics-physical science high-school teacher in Group IV.

The best classification of the 36 occupations so far studied[2] which we have been able to evolve is given in Table 29. (The correlations and averages of correlations appearing in the table are based on Table 193.) The 36 occupations are divided into eleven groups, of which Groups III—production manager, VI—musician, VII—certified public accountant, and XI—president of a manufacturing concern contain only one member. It will be noted that each occupation correlates .60 or higher on the average with the members of its group and lower than this with the members of all other groups, with three exceptions. Personnel manager correlates on the average only .57 with the other members of Group V, and banker correlates only .55 with the members of Group VIII. Here one has the option of including these two borderline cases or not.

[2] Data regarding aviator, osteopath, coast guard, and public utility salesman were obtained after this study was completed.

We have violated our rule for the sake of simplicity: to exclude them necessitates setting up two additional groups of one case each. Aviator is the third exception. It correlates above .60 with both Groups II and III but has been assigned to Group IV because it correlates on the average of .70 with the members of that group and because it also agrees with the members of that group in having a low negative correlation with OL and a high positive correlation with MF.

The correlations between each occupation and IM, MF, OL, and intelligence are also given in Table 29. It will be noted that members of groups obtain in most cases about the same correlation with these four factors. Thus Group V correlates .54 to .84 with IM, —.03 to —.56 with MF, .02 to —.21 with intelligence, and .10 to —.49 with OL. Group II correlates, on the other hand, —.38 to —.51 with IM, .11 to .64 with MF, .28 to .35 with intelligence, and —.13 to —.28 with OL.

Classification of occupations will always depend to a considerable degree upon the requirements of the situation. In ancient days the stars in the heavens were grouped into constellations or clusters. Present-day astronomers would never classify them in the same way. It is largely a matter of convenience whether we have a few groups with many members in each or many groups containing only a few members.

One of the practical difficulties of classifying occupations may be illustrated with the occupation of artist. From Table 29 it can be seen that artist correlates .74 with the other members of Group I and correlates less than .60 with all other groups. But it does correlate .84 with author-journalist, which is assigned to Group X, and this coefficient of .84 is higher than with psychologist (.70), physician (.79), and dentist (.62), which are members of Group I. On the other hand, artist correlates only .39 with lawyer and .41 with advertiser, which are members of Group X. Since lawyer, advertiser, and author-journalist must be grouped together, as each one of the three averages .74 or higher with the other two, it is out of the question to include artist in Group X. And since it meets all of the statistical requirements for membership in Group I, it is placed there.

Recently scales for osteopath and salesman of a public utility

TABLE 29

CLASSIFICATION OF OCCUPATIONS ON BASIS OF CORRELATION OF INTERESTS*

Group	Occupation	Average of Correlations between Each Occupation and All Occupations in a Given Group											Correlation			
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	Masculinity-Femininity	Intelligence	Occupational Level	Revised Interest-Maturity, 15–25 Years
I	Artist	.74	.46	—.43	—.09	—.22	.57	.00	—.72	—.37	.55	—.03	—.44	.18	.18	—.53
	Psychologist	.69	.65	—.17	.19	.06	.60	.13	—.60	—.67	.24	—.34	—.14	.38	—.14	—.14
	Architect	.77	.69	—.09	.19	—.29	.51	—.06	—.61	—.59	.22	—.07	—.11	.23	—.03	—.46
	Physician	.79	.69	—.09	.18	—.29	.42	—.10	—.64	—.59	.21	— 08	—.06	.24	.03	—.51
	Dentist	.70	.66	.08	.43	—.28	.46	—.35	—.49	—.63	—.08	—.18	.14	.07	—.24	—.39
II	Mathematician	.69	.79	.01	.28	—.27	.37	.09	—.46	—.76	.03	—.21	.11	.35	—.13	—.47
	Physicist	.71	.90	.27	.41	— 39	.25	—.10	—.46	—.79	— 12	—.07	.32	.34	—.17	—.51
	Engineer	.46	.80	.66	.50	—.48	—.09	—.17	—.21	—.65	—.38	.13	.64	.28	—.20	—.44
	Chemist	.66	.87	.40	.50	—.34	.23	—.13	—.38	—.79	—.23	—.10	.44	.35	—.28	—.38
III	Production manager	—.14	.34	..	.44	—.25	—.46	—.19	.30	—.21	—.63	.30	.79	.04	—.23	.01
IV	Aviator	.29	.62	.63	.70	—.30	.07	—.40	—.09	—.54	—.49	—.17	.76	..	—.59	—.26
	Farmer	.25	.53	.43	.69	—.31	.07	—.59	—.07	—.61	—.59	—.33	.68	.06	—.62	—.29
	Carpenter	.23	.55	.59	.74	—.24	.14	—.51	.04	—.62	—.67	—.23	.63	—.02	—.72	—.14
	Mathematics-physical science teacher	.17	.45	.40	.67	.20	.31	—.26	.07	—.64	—.64	—.55	.49	.08	—.72	.30
	Printer	.31	.45	.23	.65	.04	.53	—.34	—.05	—.63	—.37	—.55	.37	.12	—.82	.03
	Policeman	.09	.14	.52	.65	.16	.09	—.46	.23	—.30	—.63	—.41	.57	—.13	—.77	.27
	Forest service	.21	.42	.48	.71	—.01	.13	—.50	—.05	—.55	—.57	—.39	.59	—.03	—.62	.08

* All calculations based on records of 285 college seniors. See Table 193, facing p 716.

V	Y.M.C.A. secretary	—.38	—.55	—.28	— 07	.76	.21	.05	.20	.25	—.03	—.43	—.34	—.18	—.18	.84
	Y.M.C.A. physical director	—.09	—.20	—.01	.33	.62	.36	—.20	.05	—.07	—.24	—.56	—.03	—.18	—.49	.67
	Personnel manager	—.40	—.38	.16	—.06	.57	—.05	.25	.26	.25	—.03	—.13	—.06	—.02	—.10	.75
	City school superintendent	— 18	—.38	—.46	—.25	.68	.26	.38	.03	.16	.25	—.39	—.51	—.06	.10	.63
	Minister	.21	—.12	—.48	—.01	.63	.60	.06	.30	—.16	.25	—.54	—.56	.02	—.14	.54
	Social science teacher	—.40	—.60	—.40	—.10	.71	.28	.14	.26	.28	.06	—.48	—.40	—.21	—.21	.75
VI	Musician	—.51	.19	—.46	.21	.28	..	—.08	—.36	—.37	.23	—.60	—.41	.02	—.42	.04
VII	Certified public accountant	—.08	—.08	—.19	—.44	.11	—.08	..	.12	.16	.40	.15	—.29	22	.43	.09
VIII	Purchasing agent	—.60	—.25	.57	.02	—.24	—.60	.02	.61	.36	—.43	.43	.46	—.21	.01	.03
	Office worker	—.65	—.48	.25	.12	.31	—.18	.06	.68	.29	—.45	— 14	.16	—.25	—.33	.61
	Accountant	—.54	—.19	.45	.17	.20	—.30	.28	.64	.07	—.50	—.06	.32	—.10	—.26	.52
	Banker	—.67	—.59	—.07	—.20	.05	—.37	.14	.55	.49	—.16	.08	—.01	—.33	.05	.17
IX	Real estate salesman	—.55	—.74	—.25	—.55	.03	—.36	.13	.29	.84	.32	.42	—.28	—.22	.41	—.02
	Life insurance salesman	—.50	—.80	—.38	—.61	.29	—.23	.19	.20	.83	.39	.30	—.49	—.26	.47	.27
	Sales manager	—.67	—.70	.01	—.50	.10	—.51	.17	.41	.83	.14	.52	—.31	—.23	.42	.21
X	Lawyer	.12	— 24	—.62	—.63	.12	.10	.57	—.31	.34	.75	.12	—.62	.13	.60	—.15
	Author-journalist	.52	.11	—.64	—.44	—.11	.39	.29	—.60	.00	.75	.08	—.66	.18	.46	—.45
	Advertising man	.04	—.40	—.63	—.66	.12	.20	.34	—.25	.51	.74	.23	—.74	.01	.52	—.08
XI	President of manufacturing concern	—.14	—.06	.30	—.41	—.42	—.60	.15	.08	.41	.14	..	.03	—.03	.63	—.32

have been completed. Neither of these two occupations can be fitted satisfactorily into existing groups. Osteopath might be assigned to Group I, as it correlates on the average of .55 with the members of that group; but it correlates only .49 with psychologist, .40 with architect, and .38 with artist. Possibly Group I should be subdivided and physician, dentist, and osteopath be grouped together. Public utility salesman, we suspect, typifies a large number of salesmen whose interests fall somewhere between Groups VIII and IX. House-to-house salesmen of two entirely different commodities have such characteristics. Our particular utility salesmen average .47 with the members of Group VIII and .41 with Group IX. Data on additional salesmen will apparently provide us with a new occupational group. Coast guard is located about halfway between Group IV and Group I and can hardly be assigned to either group, in contrast to aviator, who can be assigned to the former. Here again a new group may emerge composed of aviator and coast guard having correlations with IM, MF, and OL, respectively, of about —.30, .74, and —.51.

No attempt has been made to classify occupations on the basis of mean scores or overlapping because it would require the scoring of all our criterion blanks on all the scales.[3] It would, however, be interesting to see what the conclusions would be, knowing from the material on page 113 that differentiation on the basis of correlation does not give quite the same results as with mean scores.

The material in chapters 7 and, particularly, 21 emphasizes the fact that the correlations used in this chapter express relationships based on a particular point of reference (the men-in-general group used in constructing the scales). That is, they indicate how occupations are located with regard to the particular point of reference which was used. If the coefficient is negative, the two occupations are located on different sides of the point of reference; if positive, on the same side. If another point of reference was used, the correlations would be altered; but as far as we have been able to analyze the matter it appears that the classification of occupations would be little altered thereby.

[3] Classification of occupation on the basis of intercorrelations can be accomplished much more easily since it is only necessary to score one group on all the scales and calculate the correlations between the resulting scores.

Occupations have been classified not only in terms of intercorrelations but also on the basis of factor analysis.

CLASSIFICATION BASED ON FACTOR ANALYSIS

Factor analysis is a statistical procedure whereby a table of intercorrelations may be expressed by far fewer figures. In order to explain what is involved in factor analysis in a few words, let us assume for the moment that three[4] independent factors will account for all the intercorrelations in Table 193 (facing p. 716). Each occupation can be conceived to be a point (or small sphere centering about that point) near the surface of a large sphere.[5] If we recall our solid geometry, we will realize that each point can be located by three co-ordinates, thus:

	Co-ordinates		
Occupations	1	2	3
A	.80	.45	.38
B	.35	—.65	.66

Occupation A is located accordingly .80 upward from the center of the sphere, .45 backward from its center, and .38 to the right of the sphere. Occupation B is similarly located .35 above, .65 forward, and .66 to the right of the center. When so plotted, both A and B will be located at different points on or near the surface of the sphere.

When two occupations are so located on the surface of a sphere, the correlation between them is equal to the cosine of the central angle between them (i.e., the angle formed by lines connecting A and B with the center of the sphere). This correlation may be calculated directly from the two sets of co-ordinates, using the formula: r_{AB} = (co-ordinate $1_A \times$ co-ordinate 1_B) + (co-ordinate $2_A \times$ co-ordinate 2_B) + etc. The correlation between occupations A and B would then be $r_{AB} = (.80 \times .35) + (.45 \times -.65) + (.38 \times .66) = .238$.

This is not the place to describe how intercorrelations are transmuted into co-ordinates. The reader unfamiliar with the statistics of factor analysis will have to content himself with accepting the

[4] Actually 4 or 5 factors are required.

[5] Occupations are "located" in the sense that the scores of all the blanks constituting them appear as points in space and the points of each occupation cluster together about their average, which is viewed here as the location of the occupation.

statement that such can be done and that the intercorrelations in Table 193 may be expressed by the five sets of co-ordinates given in Table 30. The reader may check these co-ordinates by converting them back into correlations, using the formula stated.

Seven factor analyses.—From a table of intercorrelations of the interests of men engaged in 18 occupations supplied by the writer, Thurstone[6] calculated the factor loadings of each occupation. He concluded that only four factors are necessary to account for the varying interests of these occupations.

As additional occupational scales have been developed, four more factor analyses have been computed by us. The five analyses have been based upon 18 variables in the first case (Thurstone's) and upon 25, 30, 32, and 36 variables, respectively, in the second to fifth cases. The fifth analysis differs, furthermore, from the preceding four analyses in that it is based upon the revised scales, and consequently no variable in the fifth analysis is exactly comparable to any variable in the earlier analyses.

The factor loadings from the fifth-factor analysis are given in Table 30, also those loadings when equalized.[7]

Three conclusions may be drawn from the five factor analyses. First, the unrotated factor loadings have remained quite constant. Second, the relationships between pairs of occupations have been even more constant. Third, the same classification of occupations has been indicated in all five analyses.

To show that the relationships between the various factor loadings, or co-ordinates as we prefer to call them, have been quite constant, rank-order correlations have been calculated between the five pairs of analyses (see Table 31). The co-ordinates of any

[6] L. L. Thurstone, "Multiple Factor Analysis," *Psychological Review* (1931), **38**, 406–27; and "A Multiple Factor Study of Vocational Interests," *Personnel Journal* (1931), **10**, 198–205.

[7] Equalized loadings are secured by dividing each loading by the square root of the sum of the squares of the loadings. The difference between the sum of the squares of the loadings and unity represents chance errors (unreliability) plus specific factors. Since both are ignored when calculations are based entirely on the factor loadings, it is preferable to equalize the loadings so that each point is made to occur on the surface of the sphere rather than to deal with points which vary considerably in the distance at which they are located by the unequalized loadings from the surface of the sphere. Subsequent to this analysis an error was discovered in the correlation between sales manager and masculinity-femininity—the coefficient of —.305 should have been —.120.

factor one correlate .80 or higher with the co-ordinates of any other factor one. Factor two of one analysis correlates .78 or higher with either the second or the third factor of another analysis—three times with another second factor, four times with a third factor. In reverse manner, factor three correlates .63 or higher with factor two in three cases and correlates .84 or higher with factor three in four cases. (But the second factor in the fifth analysis does not correlate above .57 with either the second or third factors of the second analysis, whereas the third factor in the fifth analysis correlates .80 with the second and —.84 with the third factor in the second analysis.) Factor four of one analysis correlates between .73 and .87 with a second fourth factor in five out of seven comparisons. Carter, Pyles, and Bretnall[8] found similar agreement between the first three factors of Thurstone's analysis and the first three factors in each of two factor analyses that they made when scores of high-school boys were considered, but they found only one case in three comparisons where the fourth factor correlated highly with another fourth factor. The situation is quite different with the fifth factor—in no case does any fifth co-ordinate correlate above .58 with any other co-ordinate and the average of four correlations between the fifth factors of different analyses is only .44. All in all there is high agreement between any one of the first four factors in one analysis with some one of the factors in another analysis and generally with the same numbered factor, but this high agreement does not hold with respect to the fifth factor.[9]

Although there has been surprisingly high correlation between the factor loadings in all five factor analyses and the two of Carter, Pyles, and Bretnall, there has been at the same time considerable shifting of the positions of occupations upon the surface of the

[8] H. D. Carter, M. K. Pyles, and E. P. Bretnall, "A Comparative Study of Factors in Vocational Interest Scores of High School Boys," *Journal of Educational Psychology* (1935), **26**, 81–98.

[9] How many factors to extract is not an easy question to answer. The sum of the squares of the loadings (Table 30) should not exceed the reliability of the test (see Table 4, p. 78). The mean of the former is .842 and that of the latter .875, a difference of .033. Possibly this is too close an approximation, which argues that the fifth factor should be discarded. There would be no great loss in so doing; but on the whole it seems to be worth keeping, as is pointed out below. See page 318 for further discussion.

TABLE 30

FACTOR LOADINGS FOR 34 OCCUPATIONS AND FOR MF AND OL

Group	Occupation	Factor Loadings or Co-ordinates						Factor Loadings Equalized				
		1	2	3	4	5	Sum of Squares of Loadings	1	2	3	4	5
I	Artist	.27	—.49	—.76	.20	.19	.96	.27	—.50	—.77	.21	.19
	Psychologist	.72	—.33	—.46	.17	—.12	.88	.77	—.35	—.49	.18	—.13
	Architect	.47	—.64	—.44	.12	.13	.85	.51	—.69	—.48	.13	.14
	Physician	.45	—.64	—.45	.18	.05	.85	.49	—.70	—.49	.19	.06
	Dentist	.50	—.63	—.13	.29	.20	.78	.56	—.71	—.15	.33	.23
II	Mathematician	.54	—.62	—.25	.13	—.38	.91	.57	—.66	—.26	.14	—.40
	Physicist	.55	—.79	—.08	.06	—.17	.97	.55	—.81	—.08	.06	—.18
	Engineer	.43	—.80	.31	—.20	—.04	.96	.43	—.82	.32	—.21	—.04
	Chemist	.64	—.73	.09	—.02	—.09	.97	.65	—.75	.09	—.02	—.09
III	Production manager	.19	—.32	.73	—.44	.11	.88	.21	—.34	.78	—.47	.11
IV	Farmer	.14	—.59	.56	.51	—.02	.94	.14	—.61	.57	.53	—.02
	Carpenter	.37	—.50	.64	.30	.14	.90	.39	—.52	.67	.32	.14
	Printer	.62	—.20	.38	.39	.07	.73	73	—.23	.45	.46	.08
	Mathematics-science teacher	.65	—.07	.55	.35	—.17	.89	.69	—.08	.58	.37	—.18
	Policeman	.40	.05	.72	.26	.23	.80	.45	.05	.81	.29	.26
	Forest service	...	...	...	...	...	...	...	...	...	...	...

V	Y.M.C.A. physical director	.48	.57	.24	.35	.28	.82	.53	.64	.27	.38	.31
	Personnel manager	.28	.72	.19	−.28	.10	.72	.33	.85	.23	−.33	.12
	Y.M.C.A. secretary	.14	.86	.05	.27	.09	.84	.15	.94	.06	.29	.10
	Social science teacher	.11	.90	−.01	.30	−.10	.93	.11	.94	−.01	.31	−.10
	School superintendent	.24	.76	−.31	.15	−.28	.84	.28	.84	−.34	.16	−.30
	Minister	.46	.49	−.40	.44	.08	.81	.51	.55	−.44	.49	.09
VI	Musician	.56	.09	−.36	.50	.15	.72	.66	.11	−.43	.58	.18
VII	Certified public accountant	.12	.28	−.35	−.51	−.50	.72	.14	.33	−.42	−.60	−.59
VIII	Accountant	.10	.40	.65	−.33	−.33	.80	.11	.45	.72	−.36	−.36
	Office man	−.07	.60	.64	−.11	−.08	.80	−.08	.67	.72	−.13	−.09
	Purchasing agent	−.40	.06	.65	−.46	−.06	.79	−.45	.07	.73	−.51	−.07
	Banker	−.59	.43	.31	.01	−.32	.73	−.69	.50	.36	.01	−.39
IX	Sales manager	−.61	.50	.06	−.49	.27	.94	−.63	.52	.06	−.50	.28
	Real estate salesman	−.76	.40	−.13	−.25	.23	.87	−.81	.43	−.13	−.27	.25
	Life insurance salesman	−.53	.65	−.28	−.22	.28	.90	−.56	.68	−.29	−.23	.30
X	Advertising man	−.24	.29	−.76	−.20	.24	.82	−.27	.32	−.84	−.22	.27
	Lawyer	−.12	.24	−.82	−.20	−.14	.80	−.14	.26	−.92	−.22	−.16
	Author-journalist	.01	−.17	−.92	−.01	.09	.89	.01	−.19	−.98	−.01	.10
XI	President	−.47	−.27	−.08	−.64	.15	.73	−.55	−.32	−.09	−.75	.18
Occupational level		−.47	−.04	−.57	−.48	−.12	.79	−.53	−.04	−.64	−.54	−.13
Masculinity-femininity		.02	−.43	.77	−.04	−.13	.80	.02	−.48	.86	.05	.15

TABLE 31

CORRELATIONS BETWEEN FACTOR LOADINGS*

Analysis	Co-ordinates	Second Analysis 25 Variables					Third Analysis 30 Variables					Fourth Analysis 32 Variables (Revised Scales)					Fifth Analysis 36 Variables (Revised Scales)				
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
First (18 variables)	1	.99	—.06	—.58	—.08	—.11	..	..	..	..	..	.82	—.72	.48	.58	—.27	.82	—.86	.13	.35	—.48
	2	.01	—.74	.80	.61	.46	..	..	..	..	..	—.31	—.44	—.81	.20	—.29	—.02	.10	—.96	.12	.06
	3	—.27	.84	—.13	.40	—.54	..	..	..	..	..	.32	.70	.09	.12	—.04	.01	.63	.46	.23	.10
	4	—.44	—.27	.30	—.73	.30	..	..	..	..	..	—.58	.22	.19	—.81	.31	—.74	.07	.06	—.75	—.04
Second	1	..	..	..	..	..	.80	—.85	.45	—.45	.43	.80	—.81	.33	.54	—.44	.87	—.81	—.05	.47	—.48
	2	..	..	..	..	..	—.16	.78	.29	.02	.07	.24	.82	.25	.09	—.08	—.02	.57	.80	.10	.08
	3	..	..	..	..	..	— 23	.05	—.96	—.24	—.06	—.36	—.09	—.90	—.27	—.10	—.39	.35	—.84	—.21	.15
	4	..	..	..	..	..	.39	.11	—.63	—.81	.33	.20	.10	—.77	.39	—.51	.30	.49	—.50	.49	.11
	5	..	..	..	..	..	—.17	—.35	—.44	.12	.50	—.22	—.40	—.28	—.58	—.36	—.07	—.07	— 55	—.40	—.45
Fourth	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.84	—.49	.27	.53	—.17
	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	—.49	.86	.49	—.23	.21
	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.12	—.52	.84	—.07	—.20
	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.72	—.37	—.04	87	.47
	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	—.52	—.12	.12	—.18	.43

* Number of variables included in correlations: First *vs.* second analysis, 18; first *vs.* fourth, 18; first *vs.* fifth, 17; second *vs.* third, 21; second *vs.* fourth, 24; second *vs.* fifth, 22; fourth *vs.* fifth, 28.

sphere. Consider, for example, the co-ordinates of engineer and farmer in the five analyses (see Table 32). Engineer has different co-ordinates in each analysis, and so has farmer. But comparison of the two sets of co-ordinates makes clear that farmer and engineer are located near each other in all five analyses.

TABLE 32

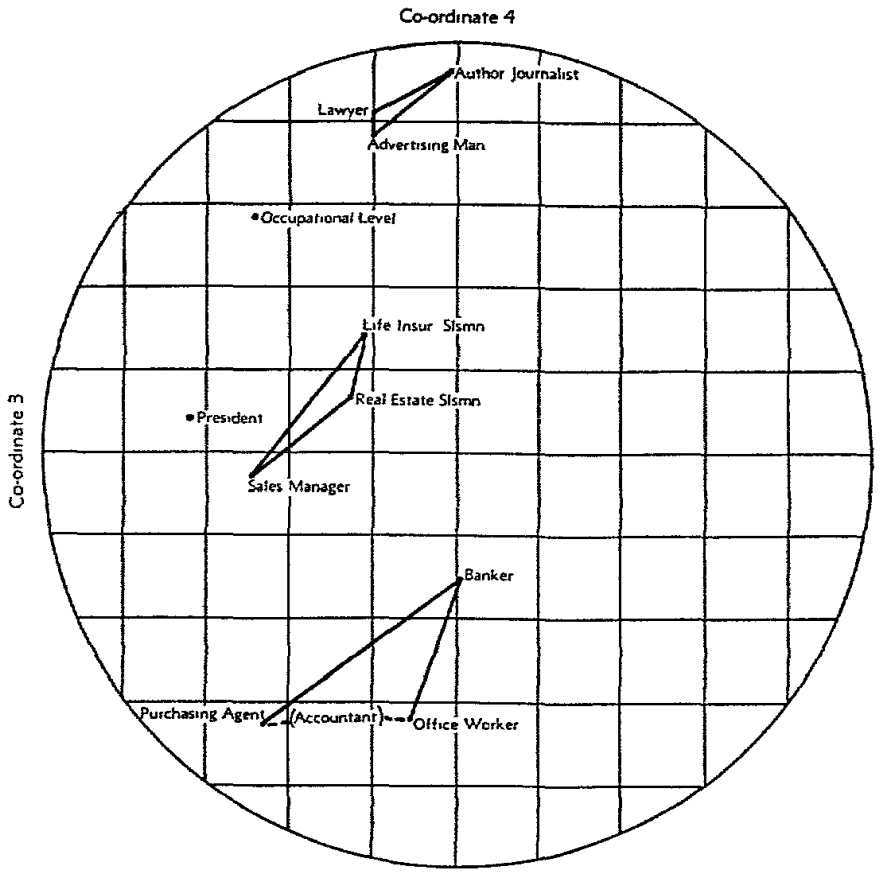
FACTOR LOADINGS OF ENGINEER AND FARMER FROM FIVE FACTOR ANALYSES

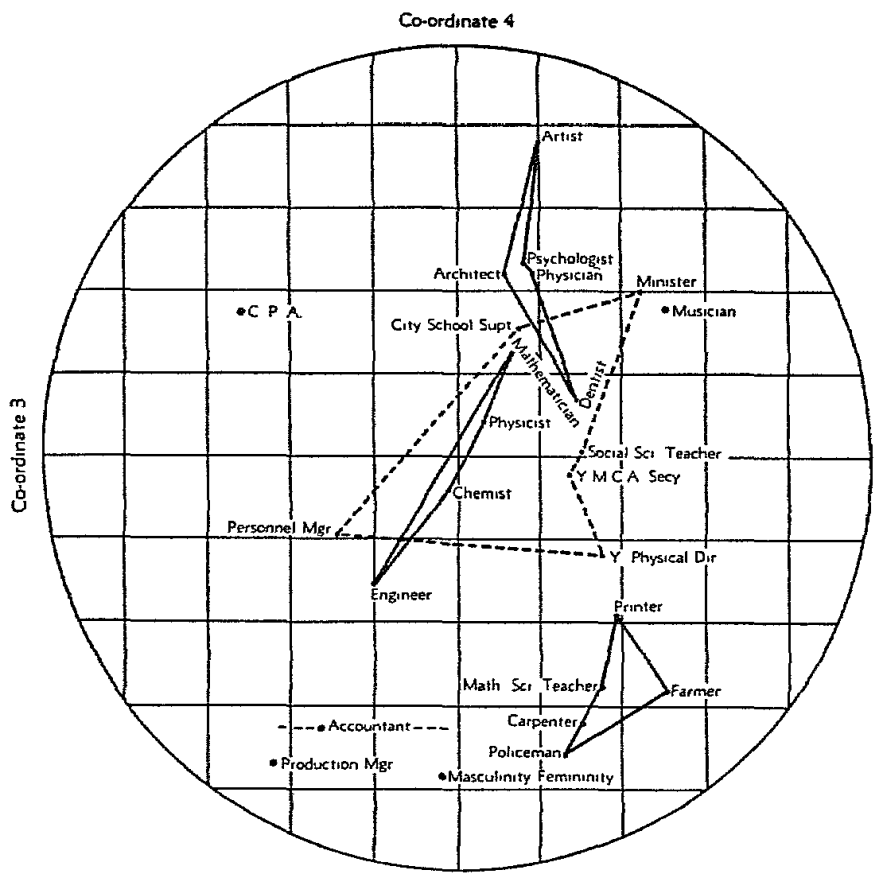
Analysis	Factor Loadings of Engineer				Factor Loadings of Farmer			
	1	2	3	4	1	2	3	4
First	.84	—.36	.22	.16	.71	—.54	.01	.18
Second	.80	.03	—.26	—.43	.60	.26	—.32	—.59
Third	.39	—.52	.64	.27	.32	—.25	.68	.11
Fourth	.50	—.48	.68	—.07	.45	—.21	.64	.16
Fifth	.43	—.80	.31	—.20	.14	—.59	.56	.51

For certain purposes it is very helpful to picture the relationships expressed by factor loadings in graphic form. Figures 5 and 6 present factors one, three, and four of the fifth analysis as given in Table 30 under the heading of "factor loadings equalized."[10] Occupations with plus co-ordinates in factor one are shown above the equator of a sphere as one looks down upon it (see Figure 5). Similarly occupations with negative co-ordinates in factor one are shown below the equator (see Figure 6). Figure 5 should be viewed as the upper surface of a sphere with the north pole at the top (up, toward the observer). Figure 6 should be thought of as the lower surface of a glass sphere with the south pole at the bottom, with the observer looking down through the sphere and seeing only the lower surface.

In drawing these diagrams certain conventions have been used. Where two groups of occupations overlap, as does Group V with Groups I and II in Figure 6, dotted lines are used with one group to distinguish it more easily from the other group. When one or more members appear in the first diagram and the other members appear in the companion diagram, they are shown by dotted lines

[10] In order to compare more easily these two figures with the figures that follow, the signs of the third factor co-ordinates in Table 30 have been reversed.





FIGS. 5 and 6.—Distribution of occupations in terms of co-ordinates 3, 4, and 1 (factor loadings, equalized from Table 30). Occupations with plus co-ordinates of factor 1 shown in Figure 5, those with negative co-ordinates shown in Figure 6. See text for further explanation of the two figures. (Signs are reversed for factor 3 co-ordinates.)

if the group is in the middle of the diagram (see accountant of Group VIII in Figures 5 and 6) or by solid lines which run to the edge of the diagram if the group is near the edge of the diagram (see policeman in Figure 10, which belongs to Group IV shown in Figure 9).

Ten of the eleven groups of occupations are clearly differentiated in Figures 5 and 6; Group V, however, overlaps Groups I and II. But in diagrams showing other combinations of the five factors taken three at a time, this overlapping does not occur. See Figures 9 to 12 in this connection.

When Figures 5 and 6 are compared with similarly drawn diagrams based on the first four analyses, it is evident that each occupation maintains approximately the same relation to all the others in all five analyses. The average discrepancy amounts to 1/20 of the circumference of the globe, which is equal to the side of one of the squares shown in the figures. But in making these comparisons it is necessary to shift the various diagrams about somewhat, since the north pole of one is not equivalent to the north pole of another. Instead of looking upon the variations in co-ordinates from one factor analysis to another as real fluctuations in the positions of the occupations, one should realize there is some fluctuation of this sort occasioned by chance errors but that most of the fluctuations result in a shifting of the "north pole" of our spheres from one analysis to another. Just as San Francisco, New York, and London will retain the same relative positions regardless whether we measure latitudes from the north pole and longitudes from Greenwich or from some other two points on the globe, so these occupational locations maintain their relative positions while the "north pole" of our factor analyses shifts about.

Summary.—The five factor analyses and the two by Carter, Pyles, and Bretnall all establish the fact that four or five factors are sufficient to account mathematically for all or nearly all of the variations in interests among the occupational groups so far studied. These analyses make it possible to picture the relationships among the occupations so that groupings of occupations may be done on an objective basis. It should be noted that this holds true for analyses based on records of both high-school boys and college seniors.

Rotation of axes.—The factor loadings, or co-ordinates, obtained by factor analyses must be viewed as arbitrary axes. They do not necessarily have any real significance. But they do afford a means by which the correlational relationships between occupations may be pictured. Thurstone assumes that if the axes are properly rotated they may "become meaningful."[11] In Figures 5 and 6, Group V has loadings on factor 4 ranging from —.28 to .44. By rotation of axes Occupational Group V is shifted so that all of the occupations therein have high plus loadings in factor 4_2 (see Table 33 and Figures 9 and 10), and so we are told this factor[12] is indicative of whatever it is that constitutes Group V. This is true in the sense that Group V has high loadings in factor 4_2, but it is not true necessarily that there is any real concrete factor or trait that psychologically exists which will explain Group V. Furthermore, there is nothing to be obtained from the factor itself and the high loadings of Group V in it that tell us what this factor or trait really is. We may say that men engaged in the occupations of Group V are primarily concerned with "handling people for their presumed good" and hence factor 4_2 measures this trait. But our guess, no matter how sound is our judgment, is still only a guess—no one can tell from the data whether it is right or wrong.

Rotation of axes may make it easier to group the occupations with which we are concerned, but the same groupings can be found from the original factor loadings as from the rotated factor loadings and for that matter from the original correlations before factor analysis. The factor loadings employed as co-ordinates make it possible, however, to locate the occupations in three-dimensional space and so to ascertain the interrelations among the occupations in a more definite manner than can be done by using the original intercorrelations.

Table 33 sets forth the factor loadings which result from rotation of the original axes given in Table 30. Thurstone sets up two criteria to aid in rotation: first, to "have no significant negative projections," and, second, to "maximize the number of

[11] The meaning of factors is considered in Chapter 14.

[12] For convenience the rotated factors are numbered 1_4, 2_4, 3_2, 4_2, and 5_2, the subscript indicating the number of times the original factor was rotated.

projections that are zero or near zero."[18] The first criterion is impossible in our case, as we have as many negative as positive correlations and they are of equal size. The second criterion was followed as carefully as possible. The data were all recorded by code numbers so that there was no possibility that the rotation could have been influenced by preconceived ideas as to how the occupations should be grouped. Rotation, in this particular case, has shifted emphasis from four major factors and one minor factor to three major and two minor factors, for after rotation most of the variance of the 36 occupations is accounted for by factors one, three, and four.

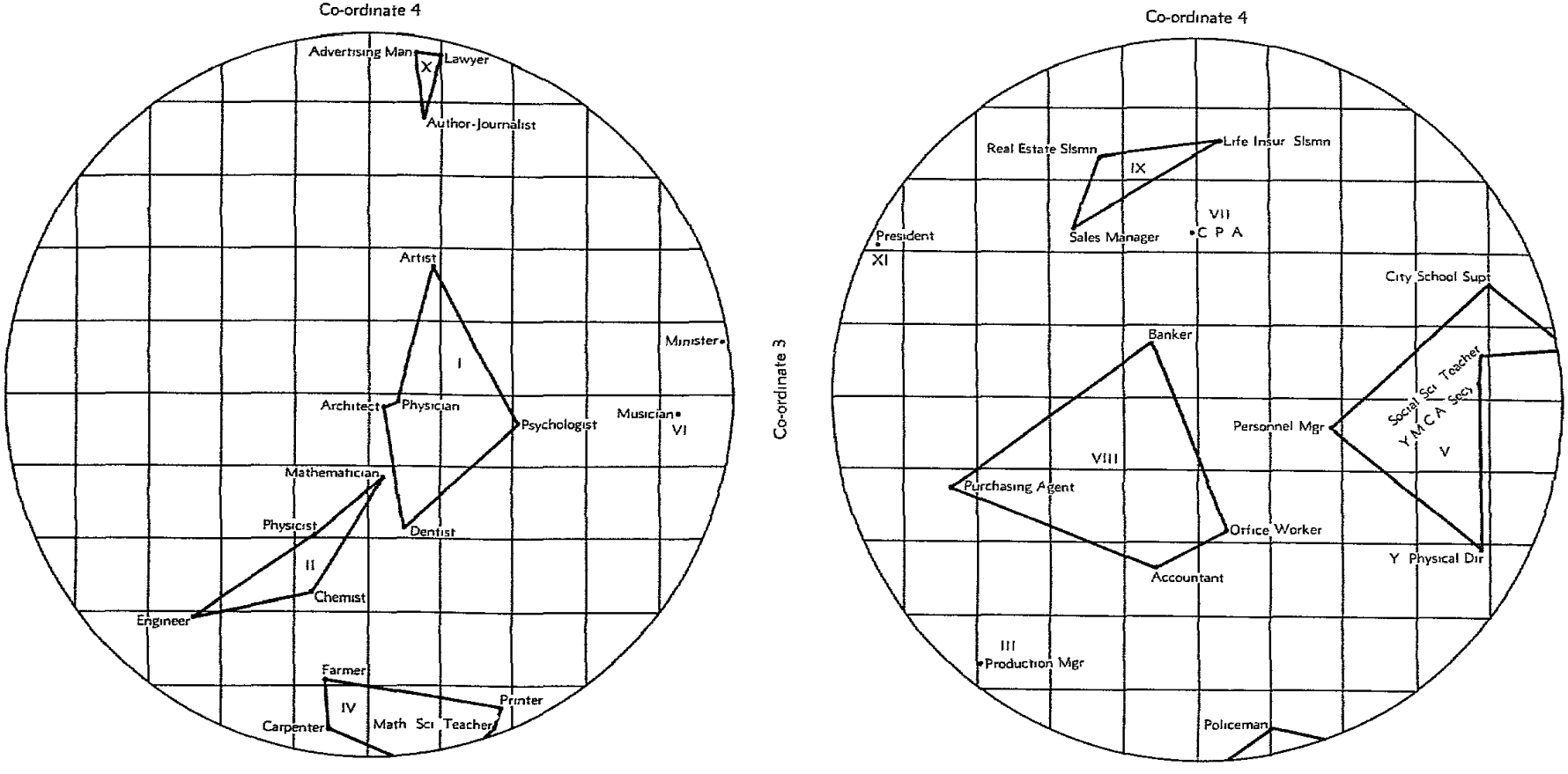
The rotated factors are presumed to be orthogonal to each other. Intercorrelations between the rotated factor loadings on the first four factors range between .10 and —.17, which may be considered as approximating zero when the unreliability is taken into account. But the loadings of factor five correlate —.59, —.24, .30 and .09, respectively, with the loadings of the first four factors.

The results of rotation of axes are shown in Figures 7 to 12. In the first two of these figures occupations are distributed with respect to factors 1_4, 3_2, and 4_2. The occupational groups are all clearly differentiated. It will be noted that the occupational groups bear about the same relationship to each other that they do in Figures 5 and 6, except that Group V is badly misplaced in Figure 6 as compared with Figure 8. Such misplacements occur quite frequently when more than three factors are involved, for the diagram can represent only three of the total number of factors—the misplacements occur because the factor that would correct the misplacement is one of the factors not included in the diagram.

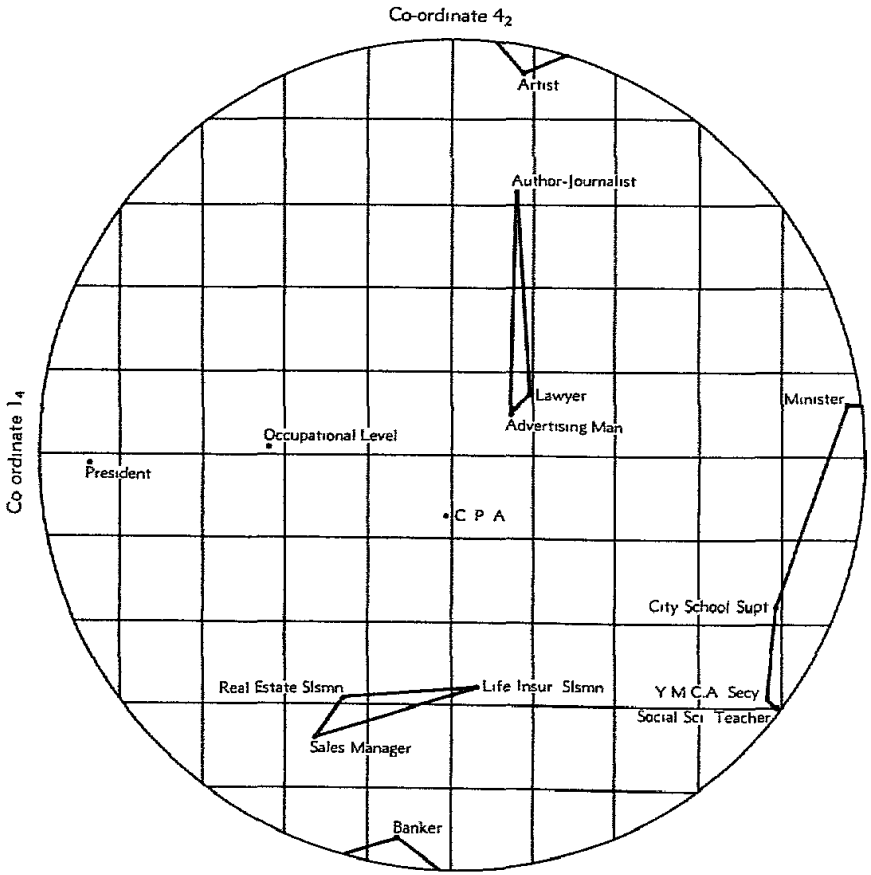
The data given in Figures 7 and 8 are repeated in Figures 9 and 10, but in the first two figures the primary distribution of occupations is in terms of factors 3_2 and 4_2, and in the last two figures it is in terms of factors 1_4 and 4_2.

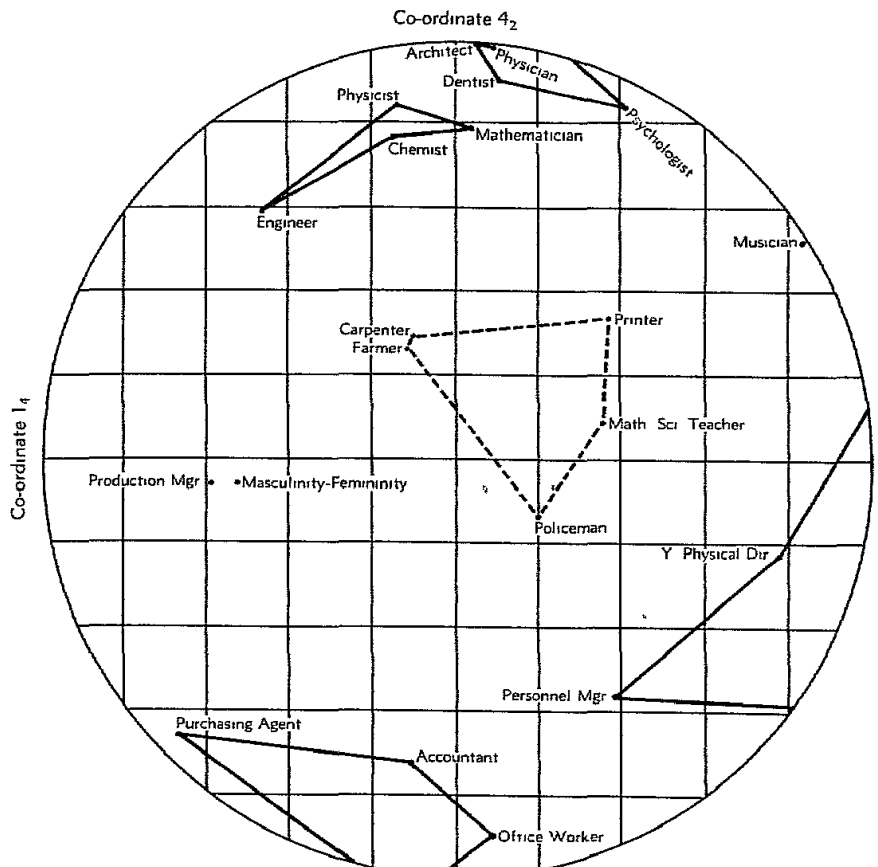
Figures 11 and 12 exemplify the point that factor 5_2 is of minor importance, since occupational groups are not well differentiated by it. Nevertheless the members of each group remain clustered together even if the groups overlap somewhat.

[18] L. L. Thurstone, *op. cit.*, p. 71.



FIGS. 7 and 8.—Distribution of occupations in terms of rotated co-ordinates 3_2, 4_2, and 1_4 (factor loadings, equalized from Table 33). Occupations with positive co-ordinates of factor 1_4 shown in Figure 7, those with negative co-ordinates shown in Figure 8.





FIGS. 9 and 10.—Distribution of occupations in terms of rotated co-ordinates 1_4, 4_2, and 3_2. Occupations with positive co-ordinates of factor 3_2 shown in Figure 9, and those with negative co-ordinates shown in Figure 10.

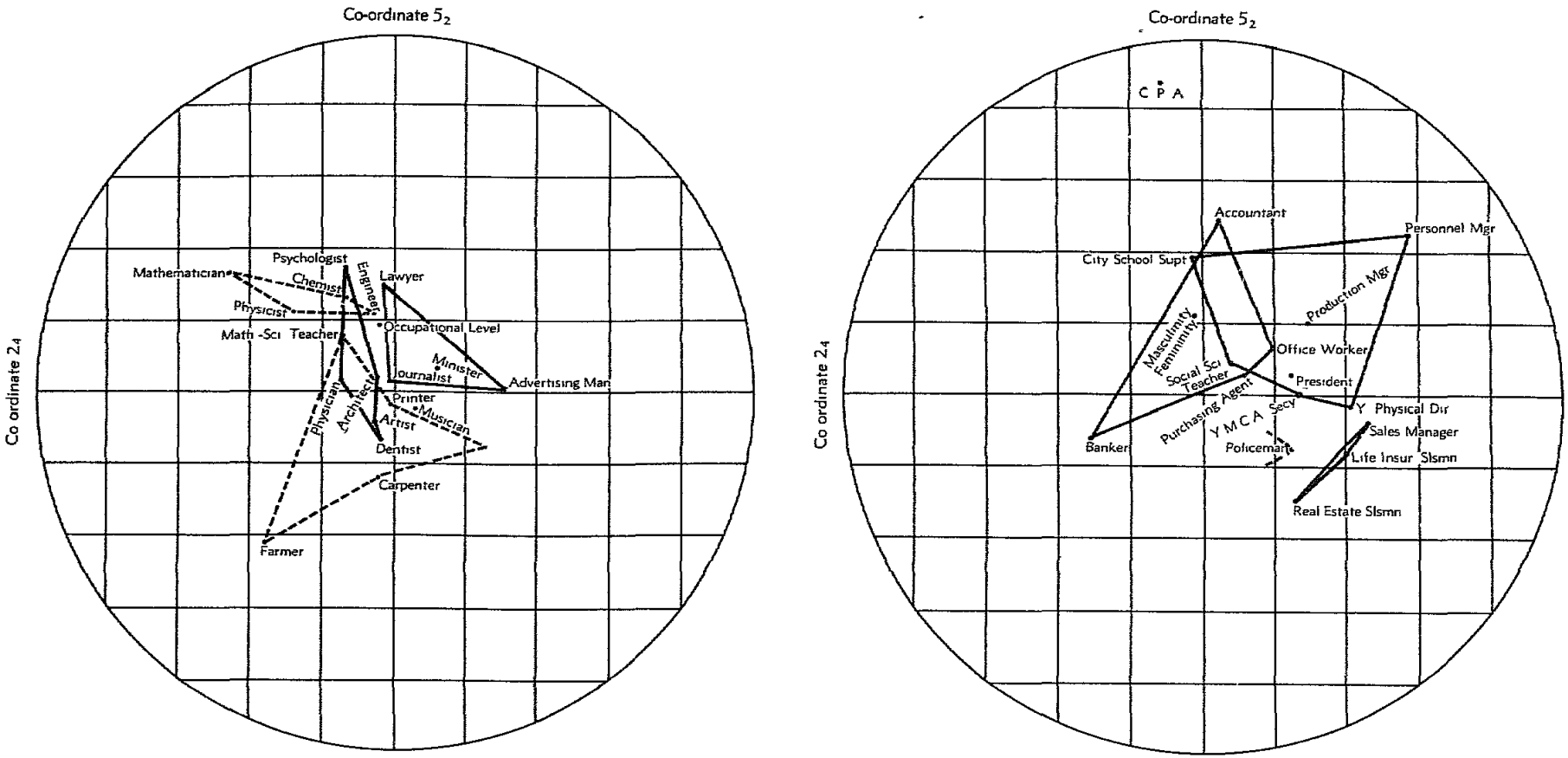


FIG. 11 and 12.—*Distribution of occupations in terms of rotated co-ordinates* 2_4, 5_2, *and* 1_4. Occupations with positive co-ordinates of factor 1_4 shown in Figure 11, those with negative co-ordinates shown in Figure 12.

CLASSIFICATION OF MEN'S OCCUPATIONS

The best grouping of the occupations so far studied has already been given in Table 29, based on an analysis of the intercorrelations between occupations. The criterion set up in that connection, namely, that there shall be a maximum average correlation between members of a group, may now be expressed in terms of factor analysis in the words—each occupation shall be "nearer" the members of its own group than the members of any other group.

"Nearness" may be determined by calculating the correlation between each occupation and the mid-point of each occupational group. On such a basis each occupation should correlate higher with its own group than with any other. The mid-point of each group may be ascertained by averaging the co-ordinates of the members constituting the group, using the factor loadings given in Table 30. Such mid-points are given in Table 34.

The correlations between any occupation and the mid-point of any group can be easily calculated when the factor co-ordinates are available by using the formula given on page 139. The correlations between each group mid-point and the members of the group are given in Table 35.[14] We have not gone to the trouble of calculating correlations between these occupations and the mid-points of groups to which they do not belong except in a few cases where there was a possibility that the latter might be higher than the correlation with the occupation's own group. No higher correlations were found.

"Nearness" may be determined by analyzing diagrams in which the occupations have been projected on the surface of a globe, as has been done in Figures 7 to 12. In the first two of these diagrams no occupation falls within the area of a group other than its own. This is equally true in Figures 9 and 10. Certified public accountant is located, however, so near to Group IX in Figure 8 that it could very well be included in that group; but in Figure 12 it lies far removed from Group IX. Similarly production manager falls within the boundaries of Group V in Figure 12 but far re-

[14] These correlations are calculated using equalized factor loadings, which result in correlations a few hundredths higher than from unequalized loadings.

TABLE 34

MID-POINTS OF OCCUPATIONAL GROUPS IN TERMS OF EQUALIZED FACTOR LOADINGS

	Occupation	I	II	III	IV	V
I	Artist Psychologist Architect Physician Dentist	.525	—.597	—.480	.212	.098
II	Mathematician Physicist Engineer Chemist	.569	—.775	.011	—.003	—.178
III	Production manager	.206	—.341	.788	—.471	.110
IV	Farmer Carpenter Printer Mathematics-science teacher Policeman Forest service	.488	—.278	.626	.397	.056
V[a]	Y.M.C.A. secretary Y.M C.A. physical director Personnel manager City school superintendent Minister Social science teacher	.324	.806	—.041	.223	.037
VI	Musician	.669	.108	—.435	.593	.180
VII	Certified public accountant	.167	.402	—.512	—.741	—.590
VIII	Purchasing agent Office worker Accountant Banker	—.290	.442	.654	—.256	—.228
IX	Real estate salesman Life-insurance salesman Sales manager	—.693	.566	—.126	—.350	.277
X	Lawyer Author-journalist Advertising man	—.134	.137	—.927	—.156	.070
XI	President manufacturing concern	—.556	—.323	—.092	—.761	.180

	I	II	III	IV	V
[a] V omitting personnel manager	.312	.782	—.092	.326	.020

TABLE 35

CORRELATIONS BETWEEN MID-POINT OF GROUPS AND MEMBERS OF THE GROUP IN TERMS OF EQUALIZED FACTOR LOADINGS

Group	Members of the Group	I	II	IV	V	VIII	IX	X
I	Artist	.873						
	Psychologist	.836						
	Architect	.951						
	Physician	.957						
	Dentist	.882						
	Mean	.900						
II	Mathematician	....	.904					
	Physicist	....	.972					
	Engineer	....	.891					
	Chemist	....	.968					
	Mean	....	.934					
IV	Farmer	....	....	.804				
	Carpenter	....	....	.814				
	Printer	....	....	.889				
	Mathematics-science teacher	....	....	.859				
	Policeman	....	....	.842				
	Mean	....	....	.842				
V	Y.M.C.A. physical director	....	....	....	.773[a]			
	Personnel manager	....	....	....	.713			
	Y.M.C.A. secretary	....	....	....	.872			
	Social science teacher	....	....	....	.859			
	City school superintendent	....	....	....	.800			
	Minister	....	....	....	.739			
	Mean	....	....	....	.793			
VIII	Accountant	....	....	....	....	.812		
	Office worker	....	....	....	....	.844		
	Purchasing agent	....	....	....	....	.785		
	Banker	....	....	....	....	.743		
	Mean	....	....	....	....	.796		
IX	Sales manager	....	....	....	....	....	.976	
	Real estate salesman	....	....	....	....	....	.984	
	Life insurance salesman	....	....	....	....	....	.973	
	Mean	....	....	....	....	....	.978	
X	Advertising man	....	....	....	....	....	....	.912
	Lawyer	....	....	....	....	....	....	.930
	Author-journalist	....	....	....	....	....	....	.890
	Mean	....	....	....	....	....	....	.911

[a] The corresponding correlations between scores on Group V Scale and the specific occupational scales are: .779, .688, .930, .891, .865, and .850; mean of the six is .833.

moved from that group in Figures 8 and 10. Figures 11 and 12 illustrate many violations of this criterion of nearness, for in these diagrams there is considerable overlapping between groups. But no single diagram, or pair of diagrams, can be accepted as final proof of "nearness." Since it is impossible to depict five-dimensional space in a diagram, it is necessary to depict all the combinations of five dimensions taken three at a time. A survey of all such combinations makes clear that each occupation is nearer its own group as given in Table 30 than any other group.

Previously it has been pointed out that artist might be classified with journalist but not with Group X, to which journalist seemingly belongs. The correlation between artist and the mid-point of Group X is only .59—far lower than the coefficient of .87 with Group I. It has also been mentioned that Group V was a rather heterogeneous group and that personnel manager did not quite qualify for membership in it. If personnel manager is excluded, the mid-point of Group V is shifted only slightly and the average of the correlations between the remaining five members and the mid-point of the group is raised from .809 to .824. This is good evidence that inclusion of personnel manager in Group V does not appreciably lower its homogeneity.

Table 35 gives the correlations between occupations within a group and the group as a whole. These correlations are all above .83 in Groups I, II, IX, and X, emphasizing the homogeneity of interests of the occupations included in each group. Groups V and VIII are less homogeneous, since certain occupations correlate between .71 and .80 with the group to which they have been assigned. Group IV will be considered below.

The relationships between occupational groups are expressed in Table 36 in terms of correlations between the mid-points of the groups, i.e., the five co-ordinates of each group. The groups are unrelated for the most part; among 55 coefficients there are only two above .50 and eleven below —.50. When these groups are plotted as in the preceding figures, using factors I, II, and IV from Table 34, it appears that they are well distributed over six of the eight octants. The question naturally arises: are there no occupations with co-ordinates which would locate them in the two unoccupied octants? It is possible that this is the case; on the other

hand, it is possible that there are occupations with these specifications which have not yet been investigated by us. If so, it is highly desirable that representatives of such occupations should be included in order to afford a better picture of a man's occupational interests.

TABLE 36

CORRELATIONS BETWEEN OCCUPATIONAL GROUPS, CALCULATED FROM MID-POINT OF THE GROUPS IN TERMS OF EQUALIZED FACTOR LOADINGS*

Group	Typical Occupation	I	II	III	IV	V	VI	VII	VIII	IX	X
I	Physician	..	..	..	..	..	..	..	..	..	..
II	Chemist	.71	..	..	..	..	..	..	..	..	..
III	Production manager	—.15	.37	..	..	..	..	..	..	..	..
IV	Printer	.21	.47	.50	..	..	..	..	..	..	..
V	Y.M.C.A. secretary	—.23	—.43	—.33	.00	..	..	..	..	..	..
VI	Musician	.62	.24	—.49	.26	.44	..	..	..	..	..
VII	C.P.A.	—.11	—.07	—.19	—.55	.17	—.15	..	..	..	..
VIII	Accountant	—.77	—.42	.39	.03	.16	—.59	.12	..	..	..
IX	Life insurance	—.65	—.83	—.23	—.66	.16	—.48	.18	.36	..	..
X	Lawyer	.26	—.20	—.71	—.72	.07	.24	.45	—.46	.34	..
XI	President	—.19	—.09	.29	—.51	—.58	—.76	.21	.11	.50	.24

* Corresponding coefficients for some of the correlations in this table are given in Table 41, p. 171, there based upon actual scores of group scales.

In our first published classification of occupations[15] Group I comprised the present Groups I and II and also farmer, now of Group IV. Figures 7 to 10 show that there is a continuum extending from artist to policeman. If records were available of many other occupations similarly located, it is likely that the occupations in this area would be re-classified into a larger number of groups. Our present Group V was formerly presented as Group IIIa and IIIb, minister and schoolman constituting Group IIIa. The schoolman group, representative of high-school teachers, principals, and professors of education, has been discarded, and in its place appear the two occupations of high-school teacher of mathematics–physical sciences and high-school teacher of social sciences. These teachers have quite dissimilar interests, correlating only .13. Instead of minister correlating .84 with schoolman, the former correlates .63 with social science teacher and only .21 with mathematics–physical science teacher. There is therefore no justi-

[15] *Vocational Interest Blank Manual,* January 1933.

fication for including minister and teacher in a subgroup. Minister has consequently been assigned to Group V; but this gives us a rather heterogeneous group in which minister and personnel manager correlate only .41.

Group IV meets the statistical requirements for a group, each member correlating .59 or higher with every other member, each member correlating between .80 and .89 with the mid-point of the group and all members being closely clustered together in all the figures. But the group appeals less to common sense than any other group. On the basis of the data in this chapter it would seem necessary to group these occupations together. Data, however, to be presented in chapters 21 and 22 give us more than enough warrant to view such a grouping as only temporary.

Since grouping occupations must be done upon data at hand it must be expected that reclassifications will result when additional occupations have been analyzed. The writer is confident a new group falling between Groups VIII and IX will be set up at a later date composed of salesmen who call upon customers in their homes. Since the interests of salesmen selling highly technical goods do not agree with this type of salesman nor with the salesmen in Group IX, it is likely that another occupational group will appear composed of such men.

Naming occupational groups.—It is fairly easy to give names to several of these occupational groups. Group II is concerned with mathematics and physical sciences; Group V, with handling people for their presumed good; Group VIII, with office activities; Group IX, with sales; and Group X, with linguistic activities. It is not, however, at all easy to summarize Groups I and IV. Although names make it easy to refer to a group and seem to be demanded by most people, even psychologists, yet it seems preferable at this stage in the development of our understanding of vocational interests to content ourselves with referring to the groups by mere number. As soon, for example, as Group IX is called the sales group, the tendency will be to measure all kinds of sales activities by the scales belonging to this group. But this is not proper, since, as has already been pointed out, there are at least two types of salesmen who do not belong in Group IX.[16]

[16] See p. 436.

Managerial and teaching activities not common to any group.—It is interesting to note that managerial activities in business appear in different groups—production manager is in Group III, personnel manager in Group V, sales manager in Group IX, advertising manager in Group X, and president in Group XI; and comptroller would very probably fall in Group VIII. The intercorrelations between these managerial positions are given in Table 37. According to these figures the interests of a president of a

TABLE 37

CORRELATIONS BETWEEN MANAGERIAL ACTIVITIES IN BUSINESS

Occupation	Personnel Manager	Sales Manager	Advertising Manager	Accountant	President
Production manager	.16	.01	—.63	.45	.30
Personnel manager	...	.36	.13	.46	—.13
Sales manager	...	...	.41	.23	.52
Advertising manager	...	...	...	—.39	.23
Accountant, including comptroller	...	...	...	...	—.06

manufacturing concern are most like those of a sales manager (.52) and next like those of a production manager (.30). His interests are little related to those of an advertising manager (.23) or a personnel manager (—.13). Evidently the interests of managers per se are less significant than the interests which pertain to the kinds of things with which the managers deal.

It is also worthy of note that the high-school teacher of mathematics and physical science belongs in Group IV, whereas the teacher of social sciences belongs in Group V. The correlation between their interests is only .13. The theory upheld by most departments of education that all teachers should be interested in teaching young people first and only secondarily interested in their subject matter may possibly be a worthy ideal. But the facts of the case are that these two types of men teachers have quite different interests. The former correlate .49 with masculinity-femininity, the latter —.40. The same situation holds true with respect to women high-school teachers (see Table 38). Evidently teaching per se, like managing per se, is less significant than the specific kind of teaching or managing. Whatever one may wish to believe

regarding the proper function of teaching, he must recognize that today teachers of mathematics and science have interests that are quite distinct from those of teachers of the social sciences.

TABLE 38

CORRELATIONS BETWEEN DIFFERENT KINDS OF WOMEN TEACHERS

Occupation	Elementary School	Social Science	Physical Education	Math.-Physical Science
English teacher	.05	.83	—.13	—.19
Elementary school teacher	...	.28	.54	.33
Social science teacher	...	...	.19	.40
Physical education teacher	...	...	...	.46

All this is similar to what has been noted regarding other types of tests. For example, the specific materials of a memory test are much more effective in determining correlation than the methods of testing memory. Anastasi says:

When the similarity among the tests was one of process, structure, or form, no clear-cut group factor could be discovered within them. Such was the case with speed and memory. Both may be tested with any kind of material. On the other hand, the clearly established verbal and numerical factors are definitely linked up with materials. A common factor will be found through verbal tests, regardless of what the subject is required to do with the words . . . . Thus content factors cut across the boundaries of form and seem to be the most potent determiners of uniformity of response.[17]

CLASSIFICATION OF OCCUPATIONS OF WOMEN

If the criterion for classification of men's occupations is used—namely, that occupations shall correlate at least .60 with each other—it is possible to include thirteen of the eighteen occupations for which we have interest scales in groups of two or more. This gives us, all told, ten groups (see Table 194, p. 718, or Table 39). Group IV, composed of teacher of physical education and nurse, Group VII, composed of teacher of social sciences and Y.W.C.A. secretary, and Group X, composed of librarian, author, and artist, are quite satisfactory, although few in number per group. Group VIII, composed of social worker and lawyer, is on the ragged edge

[17] A. Anastasi, *Differential Psychology* (The Macmillan Company, 1937), p. 313.

of acceptability, as the two correlate only .64. Group V, composed of housewife, office worker, stenographer, and elementary school teacher, does not quite meet our standard, in that elementary school teacher and stenographer correlate .55 instead of .60. If the standard was lowered to a correlation of .53, Groups IV and V could be combined; but it seems preferable to adhere to .60 as far as possible. After all, a correlation of .60 does not postulate very great similarity.

Groups IV and V are composed of women with interests more or less similar to those of married women. In contrast are women physicians, social workers, lawyers, English teachers, librarians, artists, and authors, whose interests correlate negatively with the distinguishing interests of housewife.

Scores on the Allport-Vernon *Study of Values* and on the Lecky *Individuality Record* as reported by Duffy and Crissy and by Burgemeister support the classification given. (See p. 342.)

It was not easy to arrive at a satisfactory grouping of men's occupations when there were only seventeen of them. As the number has grown, a better classification has emerged. The same should be true as additional occupational scales for women are developed.

Classification by Manson and by Berman, Darley, and Paterson.—Upon data supplied by Manson and by Berman, Darley, and Paterson, the latter arrived at the following classification of women's occupations based upon the Manson scales.

- Teaching
  - A. High-school teacher
  - B. Grade-school teacher
- Higher clerical
  - A. Private secretary
  - B. Stenographer
  - C. Office manager
- Lower clerical
  - A. Office clerk
  - B. Bookkeeper
- Sales
  - A. Retail saleswoman
  - B. Sales proprietor
- Nursing
  - A. Trained nurse[18]

In general our classification agrees with this. Teachers are distinct from the other groups listed by Berman, Darley, and Paterson. But if teachers are subdivided according to the subject matter that is taught, they will fall into not one group but five or more

[18] Berman, Darley, and Paterson, *op. cit.*, p. 24.

groups. Our occupation of general office worker includes office managers, office clerks, and bookkeepers. Possibly if the three were considered separately the classification suggested by Berman *et al.* would be obtained. In the case of nurse the two classifications clash. The interests of our nurses, who are a superior group, correlate definitely with office people and housewives (average correlation of .57). According to the data furnished by Berman *et al.*, the correlations between nurse and office people range between —.05 and —.75, with an average of —.43. Further research is indicated.

Factor analysis.—The factor loadings, which result from a factor analysis of the data in Table 193 (facing p. 716) are given[19] in Table 39. Factor V has questionable value and can very well be disregarded.

Subsequent to our factor analysis Crissy and Daniel[20] corresponded with us about an analysis made by them. As their and our factor loadings agreed almost perfectly,[21] we have made use here of their rotation of axes. They have tentatively named the four rotated factors "Interest in Male Association," "Interest in People," "Interest in Language," and "Interest in Science." Interests of housewives, office workers, stenographers, and nurses are heavily loaded (.83 to .71) with factor I, "male association"; whereas the interests of artists, librarians, and authors have negative loadings (—.62 to —.84) with it. This rotated factor supports our classification of occupations as to Groups V, IV, and X.

Heavy loadings of the second rotated factor occur with lawyer (.80), social worker (.69), Y.W.C.A. secretary (.78), and social science teacher (.78) and negative loadings with artist (—.61), author (—.28), and librarian (—.20). Here Groups VII and VIII are differentiated from other groups but not from each other.

[19] The scales for elementary school teacher and physical education teachers were developed after this factor analysis was made and hence were not included in the analysis.

[20] W. J. E. Crissy and W. J. Daniel, "Vocational Interest Factors in Women," *Journal of Applied Psychology* (1939), **23**, 488–94.

[21] Our first publication of correlations between women's occupations gave .70 for teacher of English *vs.* teacher of social science when it should have been .51. Although Crissy and Daniel's factors were subsequently corrected, using Dwyer's correction, there were nevertheless five factor loadings involving these two occupations, which differed from ours on an average of .043.

The third rotated factor has a heavy loading on English teacher (.76) and the slightly positive loading of .42 on librarian, with slightly negative loadings on office worker of —.57, on stenographer of —.42, and on life insurance of —.42. These data support our classification of English teacher by itself in Group IX.

TABLE 39

FACTOR LOADINGS OF WOMEN'S OCCUPATIONS, GROUPED ON THE BASIS OF FACTOR LOADINGS AND RAW CORRELATIONS

Group	Occupation	I	II	III	IV	V	h^2	Average Correlation with Members of Group	Correlation with Midpoint of Group	Correlation with MF
I	Physician	—.357	—.519	.654	.091	.182	.866	...	...	.29
II	Dentist	.575	—.403	.569	—.107	.129	.845	...	...	.29
III	Mathematics-science teacher	.390	.236	.683	—.313	—.305	.865	...	...	.27
IV	Nurse	.664	.288	.246	—.152	.438	.799	...	...	—.17
V	Housewife	.855	.325	—.225	—.127	—.070	.908	.81	.77	—.03
	Office worker	.844	.429	—.194	.152	—.129	.974	.87	.79	.02
	Stenographer	.743	.420	.423	.054	.093	.919	.84	.77	—.18
VI	Life insurance saleswoman	—.090	.129	—.250	.612	—.172	.491	...	...	.15
VII	Social science teacher	—.253	.812	.293	—.199	—.250	.911	.73	.82	—.18
	Y.W.C.A. worker	—.215	.743	.344	.045	.059	.722	.73	.73	—.29
VIII	Social worker	—.778	.293	.265	.221	.305	.903	.64	.76	—.20
	Lawyer	—.425	.503	.226	.496	—.097	.740	.64	.68	.07
IX	English teacher	—.667	.395	—.210	—.573	.023	.909	...	...	—.47
X	Librarian	—.689	—.546	—.062	—.100	—.215	.833	.80	.79	.09
	Artist	—.406	—.805	—.192	—.239	.100	.917	.79	.84	.07
	Author	—.709	—.605	—.325	—.025	.122	.990	.82	.89	—.07
MF		.152	—.306	.273	.268	—.480	.493	...	...	...
Teacher in general[a]		—.382	.564	.265	—.523	—.241	.866	...	...	—.19

[a] This group was used in the factor analysis It has subsequently been dropped, since an average of all kinds of women teachers has questionable significance.

The fourth rotated factor has heavy loadings on physician (.70), dentist (.68) and mathematics-science teacher (.65), with the slightly negative loading of —.45 on stenographer.

Either the original or the rotated factor loadings lead to the same classification of occupations, given in Table 39.

The writer fails to see any gain by naming the factors resulting from rotation. Why stenographers, office workers, nurses, and housewives should be viewed as more interested in men than are women in other occupations is a mystery. On two different occasions my wife has named the group "interest in multiplicity of detail" and "interest in working for the convenience of others"; Brewer suggests "interest in order or systematic work"[22] and Darley refers to it as "non-professional interests."[23] Naming a factor is largely guessing today.

CLASSIFICATION OF OCCUPATIONS OF MEN AND WOMEN COMPARED

Scanty as are our data regarding women's occupations, they indicate that the same classification applies fairly well to both sexes. Nineteen pairs of correlations are given in Table 40 so that the reader may see how they compare. The rank-order correlation between 45 such pairs—all that may be obtained from Tables 193 and 194—is .66, which is indicative of fairly high agreement. The bulk of the disagreement centers in correlations with lawyer, dentist, and masculinity-femininity. It is possible that men and women perform sufficiently different work in the legal profession so that the two sexes actually belong to somewhat different occupations. As it is, women lawyers are associated with social worker and to a lesser degree with social science teacher and Y.W.C.A. secretary; but men lawyers correlate only .12 with such occupations. On the other hand, women lawyers correlate only —.06 with women authors, while men lawyers correlate .76. Dentist and physician correlate only .38 among women and .87 among men, indicating that the two professions among women are less alike than among men.

[22] Letter of July 8, 1940, from John M. Brewer.

[23] J. G. Darley, *Clinical Aspects and Interpretations of the Strong Vocational Interest Blank* (Psychological Corporation, 1941), p. 13.

The masculinity-femininity scale is based upon blanks for men filled out by both men and women. As used for women who fill out the blank for women it is based upon the 263 items common to the two test blanks. It is possible that the shorter form used with women is different from the longer form used with men, although we have no reason for such a statement. It is possible that the present MF test of either form differentiates masculine and feminine interests among men better than among women, since the

TABLE 40

SHOWING SIMILARITY OF CORRELATIONS BETWEEN OCCUPATIONS AS BETWEEN DATA BASED ON MEN AND WOMEN (DATA FROM TABLES 193 AND 195)

Pairs of Occupations	Correlations	
	Women	Men
Author vs. Artist	.85	.84
Author vs. Physician	.41	.52
Author vs. Life insurance salesman	.02	.11
Author vs. Lawyer	—.06	.76
Author vs. Y.M.C.A. secretary	—.44	—.24
Author vs. Teacher, social sciences	—.40	—.15
Author vs. Dentist	—.35	.22
Author vs. Teacher, mathematics and physical sciences	—.67	—.54
Author vs. Office worker	—.81	—.70
Author vs. Masculinity-femininity	—.07	—.66
Artist vs. Physician	.45	.79
Artist vs. Life insurance salesman	—.20	—.27
Artist vs. Lawyer	—.37	.39
Artist vs. Y.M.C.A. secretary	—.64	—.37
Artist vs. Teacher, social sciences	—.59	—.37
Artist vs. Dentist	—.02	.62
Artist vs. Teacher, mathematics and physical sciences	—.45	—.19
Artist vs. Office worker	—.71	—.79
Artist vs. Masculinity-femininity	.07	—.44

items were designed for testing men and not women. This is a possibility. It is a fact that MF can well be expressed by the five factors based on the men's blank (communality of .80, see Table 30) but quite inadequately by the five factors based on the women's blank (communality of .49, see Table 39). MF in the second case clearly involves certain interests not common to women's occupations and consequently the correlations between MF and these occupations range only between .29 and —.47, whereas in the

case of men's occupations the range is much greater, i.e., from .79 to —.74.

There is much more agreement than disagreement between the two classifications of occupations among men and women. Only when data are available for many more occupations than the few considered here will it be possible to determine what is the relationship.

Chapter 9. Group Scales

There are some disadvantages in telling a young man that he has the interests of a specific occupation, as for example, a chemist. This is particularly true when he is still in high school or even in the first year or two of college. Acting upon such counsel too many young men prepare themselves too narrowly for that occupation. If, on the other hand, the young man is told he has the interests of men engaged in the physical sciences—including physics, chemistry, mathematics, engineering, and geology—the student is far more likely to take courses in all these fields and so establish a much broader foundation for any specialization he may achieve later on.

For more than a decade the writer has had in mind the development of occupational group scales in addition to specific occupational scales. The purpose has been twofold: first, to meet the situation outlined above; and, second, to reduce the labor and cost of scoring the test blank. It seemed likely that a single group scale could replace a number of occupational scales when blanks of high-school students were to be scored, and possibly about a dozen group scales could be developed which would replace thirty to fifty and possibly more specific occupational scales.

It has never been the thought of the writer that group scales would replace the occupational scales for older students, for a time comes when such students must begin their specialization and then they need information which will aid them in the proper selection of their specific life work. The advanced student who has ascertained from the use of group scales in high school that his interests are in the physical sciences would only need to have his blank scored for occupations which are members of that group, thereby eliminating the need of scoring the remaining occupations.

This program has not been carried out for two reasons. First,

group scales equal in validity to occupational scales have not yet been developed. Second, experience has shown that guidance should be based on high and low scores on all the scales and not merely upon the single highest score. Secondary interests are frequently of great service in appraising a man's interests, and often the presence of very low scores in certain directions adds much to the certainty of decision that other interests are the ones to follow. See chapter 18 for further discussion of this point.

Consequently, the writer favors the scoring of a blank on all available occupational scales in preference to using group scales at any time. But when the cost of scoring is an important factor, as it is in many school systems today, and when the students are still quite young and not ready for specialization, group scales may be used to advantage.

AVAILABLE GROUP SCALES

Group scales are developed in essentially the same manner as occupational scales. The only difference is that in group scales the data of two or more occupations are averaged to constitute the group criterion whereas in occupational scales the data of only one occupation are contrasted with a men-in-general group. In order that each occupation included in a group scale shall have equal weight, the percentages of each occupation who like, are indifferent to, and dislike each item are averaged.

The six group scales now available are those representative of the following occupations:

I. Artist, psychologist, architect, physician, and dentist
II. Engineer and chemist, and indirectly mathematician and physicist[1]
V. Y.M.C.A. physical director, personnel manager, Y.M.C.A. secretary, social science high-school teacher, city school superintendent, and minister
VIII. Accountant, office worker, purchasing agent, and banker
IX. Sales manager, realtor, and life insurance salesman
X. Advertising man, lawyer, and author-journalist

[1] As pointed out below, the group scales based on engineer, chemist, physicist, and mathematician proved unsatisfactory. In its place is used a group scale based on records of only engineers and chemists.

Since there is only one occupation so far assigned to Groups III, VI, VII, and XI, the occupational scales of production manager, musician, C.P.A., and president should be treated as group scales when the six above-named are used. This gives us ten single scales representative of ten of the eleven groups. The correlations in Table 35, page 157, indicate that Group IV is more homogeneous than Groups V and VIII; but no group scale for Group IV has been prepared because of certain relationships that are discussed in chapters 21 and 22.

It can be seen from Table 41 that the six groups are for the most

TABLE 41

CORRELATION BETWEEN GROUP SCALES; ALSO WITH MASCULINITY-FEMININITY

(N = 285 Stanford Seniors)

Group	Typical Occupations	II	V	VIII	IX	X	MF
I	Physician	.749	—.215	—.800	—.658	.370	—.172
II	Chemist	....	—.447	—.500	—.869	—.123	.375
V	Y.M.C.A. secretary..	....	....	.031	.185	.075	—.427
VIII	Accountant	....	....	....	.378	—.477	.244
IX	Life insurance	....	....	....	....	.290	—.353
X	Lawyer	....	....	....	....	....	—.728

part unrelated. Among 15 correlations there are only five above .50 or below —.50, i.e.: .75 between Groups I and II; —.80 between Groups I and VIII; —.66 between I and IX; —.50 between II and VIII; and —.87 between II and IX. The correlations in this table are based on the scores of 285 college seniors whose blanks have been scored on the group scales. These correlations differ on the average by only .013 from those reported in Table 36, page 159, which are based upon the factor loadings of the mid-points of each group.

Table 42 gives the distributions of ratings of occupational criterion groups when scored on the six group scales. Despite the fact that the occupations within a group correlate for the most part .80 or better with the mid-point of the group (Table 35), there are a number of cases where the distributions of ratings of members of two occupations of the same group differ greatly. In Group I, 92 per cent of artists obtain an A rating, in contrast to 49 per cent of dentists; yet both of these occupations correlate about .88 with the mid-point of the group.

TABLE 42

DISTRIBUTION OF RATINGS OF OCCUPATIONAL CRITERION GROUPS WHEN SCORED ON GROUP SCALES

(Figures are percentages)

Group	Occupation	Standard Scores and Ratings					
		45 and Up A	40 to 44 B+	35 to 39 B	30 to 34 B—	25 to 29 C+	24 and Below C
I	Artist	92	6	2	....	...	...
	Architect	72	16	6	4	2	...
	Psychologist	74	16	6	4	...	...
	Dentist	49	23	15	8	4	1
	Physician	62	18	6	9	4	1
	Average	69.8	15.8	7.0	5.0	2.0	0.4
II	Engineer	61.5	16.0	12.0	4.5	4.0	2.0
	Chemist	78.5	12.0	5.0	4.5	0.5	0
	Average	69.8	14.2	8.5	4.5	2.0	1.0
	Mathematician	72.0	16.0	5.0	5.0	2.0	0
	Physicist	97.0	3.0	0	0	0	0
V	Y.M.C.A. physical director	75.0	7.0	8.0	7.0	2.0	1.0
	Personnel manager	48.0	11.0	18.0	10.0	8.0	5.0
	Y.M.C.A. secretary	87.0	6.0	5.0	2.0	0	0
	Social science teacher	73.0	15.0	6.0	2.0	3.0	1.0
	School superintendent	66.0	10.0	14.0	4.0	6.0	0
	Minister	92.0	4.0	3.0	1.0	0	0
	Average	71.8	12.0	7.3	4.7	3.0	1.2
VIII	Accountant	70.0	13.0	8.0	6.0	2.0	1.0
	Office worker	65.0	20.0	8.0	3.0	4.0	0
	Purchasing agent	65.0	17.0	10.0	7.0	1.0	0
	Banker	74.0	11.0	8.0	4.0	3.0	0
	Average	68.3	15.5	8.5	5.3	2.2	0.2
IX	Sales manager	66.0	9.0	13.0	9.0	3.0	0
	Life insurance salesman	81.0	7.0	8.0	4.0	0	0
	Real estate salesman	67.0	11.0	15.0	6.0	0	1.0
	Average	71.0	9.0	12.3	6.0	1.3	0.3
X	Advertiser	69.0	9.0	12.0	7.0	3.0	0
	Lawyer	56:0	19.0	13.0	8.0	3.0	1.0
	Journalist	83.0	10.0	5.0	2.0	0	0
	Average	68.7	12.7	10.3	5.7	2.3	0.3

This condition was particularly bad with respect to scores on the original Group II scale, based on an average of the four members—mathematician, physicist, engineer, and chemist. Distributions of ratings obtained with this scale are given in Table 43.

TABLE 43

DISTRIBUTION OF RATINGS BY OCCUPATIONS WHEN SCORED ON DISCARDED GROUP II SCALE (BASED ON AVERAGE OF THE FOUR MEMBER OCCUPATIONS)

Occupation	Standard Scores and Ratings					
	45 and Up A	40 to 44 B+	35 to 39 B	30 to 34 B—	25 to 29 C+	24 and Below C
Mathematician	86	8	5	1	0	0
Physicist	96	3	1	....	...	...
Engineer	40	23	14	15	6	2
Chemist	66	14	7	7	5	1
Average	72.0	12.0	6.8	5.8	2.7	0.7

Ninety-six per cent of physicists obtain an A rating, in contrast to only 40 per cent of engineers; 0 per cent of physicists obtain a B— or C rating, in contrast to 13 per cent of chemists and 23 per cent of engineers. Since the samplings of all four occupations are supposed to be equally good, it is evident that this scale is impracticable. Even with the revised scale for Group II based on data from engineers and chemists alone, there is still wide variation in ratings—97 per cent of physicists obtain an A rating, as compared with 62 per cent of engineers (Table 42). It is really surprising for both mathematicians and physicists to obtain more A ratings on this revised scale than engineers when it is remembered that the scale is based on the records of engineers and chemists with no representation from mathematicians and physicists.

The same situation holds to a lesser degree in all of the other five group scales. But in Group VIII the variation is not great. From the data in Table 35 one might expect Group scales V and VIII to be the poorest and Group scales IX and II to be the best. But Group scale VIII turns out to be the best and Group II scale the poorest. Evidently intercorrelations between occupations do not furnish an entirely satisfactory basis for grouping occupations for the purpose of constituting group scales.

We have encountered this difficulty repeatedly. Correlation measures rank order but not size of scores. Engineers have a capacity for getting low scores as contrasted with physicists, although the two sets of scores correlate .85. Mean score[2] as well as correlation needs to be considered in classifying occupations and in constructing group scales. How to accomplish this is still a puzzle.

Group scores of high-school and college students.—Table 44 gives mean scores of 1,113 students, segregated according to age

TABLE 44

MEAN STANDARD SCORE AND SIGMA ON GROUP SCALES OF 16- TO 23-YEAR-OLD MEN

Age	N	Group Scale											
		I		II		V		VIII		IX		X	
		M	σ	M	σ	M	σ	M	σ	M	σ	M	σ
16.....	116	36.1	10.3	35.4	13.6	33.6	9.7	37.1	12.0	37.3	10.0	36.5	8.3
17.....	200	36.1	10.0	34.3	12.8	35.4	9.9	37.9	11.9	36.9	9.2	36.7	8.8
18.....	200	36.6	9.8	33.8	12.7	34.7	11.3	36.5	10.4	36.8	9.1	36.9	8.0
19.....	200	34.8	10.9	30.6	13.8	38.2	9.7	38.0	12.2	38.8	9.9	37.0	8.6
20.....	177	35.2	10.7	31.9	14.0	36.9	10.3	36.9	11.8	38.1	9.9	36.7	8.6
21.....	100	35.3	11.3	31.2	13.4	38.9	11.2	36.5	12.2	37.9	10.3	36.4	9.9
22.....	73	37.8	10.2	34.2	14.5	38.3	10.3	34.0	12.4	36.8	10.2	37.5	9.1
23.....	47	35.0	11.1	32.8	14.3	39.4	10.9	37.5	13.6	36.9	10.0	35.9	9.5
16–21[a]..	993	35.7	11.5	32.9	13.4	36.3	10.4	37.2	11.8	37.6	9.7	36.7	8.7
Chance score[b]	40	36.7	3.6	29.5	6.2	35.7	3.4	34.1	4.6	38.2	3.1	40.6	2.1

[a] Data in this row are averages of data given for ages 16 to 21 years
[b] From Table 8, p. 88.

from 16 to 23 years. Age here connotes chronological age plus increasing educational status. There is no indication that group scale scores increase or decrease in size with age from 16 to 23 years except with Group V, where there is an increase in mean scores of six standard scores (critical ratio of difference is 3.2).

[2] All standard scores of 50 are equivalent in the sense that 50 is the mean score of a criterion group on its own scale. But when the data from several occupations are merged, the new mean, upon which the standard score of 50 for the group scale is based, is not necessarily equal to the mean scores of any of the individual occupations upon either the specific occupational scales or the group scale.

COMPARISON OF GROUP AND OCCUPATIONAL SCALES

The reliability of the six group scales ranges from .851 to .936 and averages .917 (see Table 6, p. 80). This is appreciably higher than the average of the corresponding occupational scales, i.e., .892 (see Table 4, p. 78).

The standard deviation of scores on the group scales averages 1.5 raw score less than on the corresponding occupational scales. The average size of weights on the group scales is .491, compared with .618 for occupational scales. Since reliability is correlated positively with both sigma and size of weights as far as occupational scales are concerned (see p. 77), it is surprising that the reliability of group scales is actually greater than the occupational scales.

A zero raw score marks the dividing point between having the interests of the occupation and not having such interests. Since 11.3 per cent of criterion groups score below zero on group scales and only 3.7 per cent do so on occupational scales (see Table 8, p. 88), it is apparent that 7.6 per cent more men do not score as is to be expected on a group scale than on an occupational scale. (The average of the standard scores corresponding to the zero raw score is 36.7 for group scales and 29.0 for the occupational scales of these groups.)

The average chance score on group scales is 35.8 standard score but only 26.7 on the 34 occupational scales. Here again group scales compare unfavorably with occupational scales, for a B rating is obtainable on the average by chance on the former compared with a C+ rating on the latter. Based on the scoring of forty blanks marked by chance, there is 3.2 per cent chance of getting an A rating on occupational scales but 26.7 per cent chance on group scales. B, B+, and even A ratings on group scales cannot be accepted with the same degree of confidence on group scales as on occupational scales.

Guidance based on occupational and group scales.—Mindful of the data in Table 42 showing that a considerable number of men, successfully engaged in their own occupation, score quite low on their group scales, we have compared group scores with the corresponding occupational scores of a considerable number of

blanks. The data from 197 college seniors appear to be typical in this connection. Each student was assigned to the occupation in which he scored highest, also to the group in which he scored highest. The distribution of these scores is given in Table 45. For

TABLE 45

DISTRIBUTION OF HIGHEST SCORE ON OCCUPATIONAL AND ON GROUP SCALES OF 197 COLLEGE SENIORS

Group	Occupational Scales	Group Scales						Total
		I	II	V	VIII	IX	X	
I	Psychologist	0.5	...	...	...	...	...	0.5
	Physician	9.5	3	...	...	1	...	13.5
II	Mathematician	1.5	...	...	...	...	0.5	2
	Engineer	...	17.7	...	...	...	...	17.7
	Chemist	4	12.5	...	...	...	...	16.5
V	Y.M.C.A. physical director	...	...	0.5	...	...	...	0.5
	Personnel manager	...	3	3.5	0.3	1	...	7.8
	Social science teacher	...	...	3	0.5	0.3	...	3.8
VIII	Accountant	...	...	...	5.3	...	...	5.3
	Office worker	...	...	2	13 2	...	1	16.2
	Purchasing agent	...	1.3	...	4.3	1	...	6.6
IX	Sales manager	...	...	...	...	6.5	...	6.5
	Realtor	...	...	...	0.3	12	4	16.3
	Life insurance salesman	...	...	0.5	...	6.5	...	7
X	Advertising man	...	...	...	...	2	8.8	10.8
	Lawyer	0.5	...	2	...	3	16.5	22
	Journalist	...	...	...	...	...	1	1
	Belongs in group	10	30.2	7	22.8	25	26.3	121.3
	Does not belong in group	6	7.3	4.5	1.2	8	5.8	32.8
III	Production manager	0.5	3.8	...	1	1	0.5	6.8
IV	Farmer	2	6.3	2.5	1	...	1.5	13.3
	Printer	...	2	...	1	...	...	3
	Mathematics-science teacher	...	4.5	0.5	...	...	...	5
	Forest service	...	0.3	...	...	...	...	0.3
VI	Musician	2.5	1	2	...	...	5.3	10.8
VII	Certified public accountant	...	...	...	...	...	1.5	1.5
XI	President	0.5	...	...	...	1	0.5	2

example, the "13.5" opposite "physician" represents twelve students who scored highest in physician and three other students who were tied for first place in physician and another occupation. In order not to count the same student more than once, decimals have been thus used in the table. On this basis among the 13.5 students who scored highest in physician 9.5 scored highest in Group I (which contains physician) and 4 scored highest in some other group than I. Considering all the data assigned to Groups I, II, V, VIII, IX, and X and to occupations belonging to these groups, 78.7 per cent of the students score highest in an occupation which belongs to the group in which they score highest.

Groups III, VI, VII, and XI are represented today by one occupation apiece. Consequently scores on occupational scales of production manager, musician, C.P.A., and president should be used in conjunction with these first six group scales. When the data from these scales are combined with those reported above, we have 81.3 per cent of students scoring highest in an occupation which belongs to the group in which they score highest. Guidance based on group scales will coincide with guidance based on occupational scales in four out of five cases.

But the guidance discussed so far is mere mechanical assignment of a student to the occupation or group in which he scores highest without reference to other scores. Let us see what happens when other scores are considered. In order to keep the discussion within bounds we shall take into account only scores of B+ or higher.

In Table 46 we have the data for nine students who scored highest in lawyer but who at the same time either scored equally high in one or more other occupations or who did not score highest in Group X to which lawyer belongs. These cases contribute 2 to agreement and 7 to disagreement in the totals given in Table 45, for there are four cases in which ties occur and five cases in which the highest group is other than Group X. When a tie occurs, guidance should take each equally into account. Consequently students No. 1 and No. 8 would be told to consider both law and advertising; similarly No. 21 would be told to consider both Groups X and IX, and No. 276 both Groups X and I. Scores on occupational scales indicate high scores in occupations in both groups for the last two

students. There is no serious disagreement in these four cases between the two systems of scoring their blanks. In the remaining five cases the evidence from occupational scales coincides approximately with that from group scales. With cases No. 43, No. 75, and No. 131 the differences between conflicting occupational scores and conflicting group scores amount to four or less standard scores. With cases No. 124 and No. 146 the group scores in other than Group X are higher than in Group X, and this is equally true with respect to occupational scores. But the differences are not great enough for the student to disregard either alternative. Mechanical guidance gives us considerable error in these nine cases; but good

TABLE 46

OCCUPATIONAL SCORES ABOVE 39 AND GROUP SCORES OF NINE STUDENTS WHOSE HIGHEST OCCUPATIONAL SCORE WAS LAWYER BUT WHOSE GROUP SCORE WAS NOT GROUP X*

Group	Occupation	No. 1	No. 8	No. 21	No. 43	No. 75	No. 124	No. 131	No. 146	No. 276
X	Lawyer	55	43	48	48	56	59	47	47	53
	Advertising man	55	43	42	..	43	50	...	43	...
	Journalist	..	..	44	..	..	43	41	...	43
	Mean	..	..	44.7	..	49.5	50.7	44.0	45.0	48.0
IX	Sales manager	..	..	40	..	44	56	...	46	...
	Realtor	..	..	...	..	51	58	...	44	...
	Life insurance	..	..	42	..	48	52	...	47	...
	Mean	..	..	41	..	47.7	55.3	...	45.7	...
V	Personnel	..	..	...	46	...	...	43	...	...
	Y.M.C.A. physical director	..	..	...	...	...	...	44	...	...
	City school superintendent	..	..	...	...	...	...	43	...	...
	Social science teacher	..	..	...	...	...	...	41	...	...
	Mean	..	..	...	...	...	...	42.8	...	...
I	Physician	..	..	...	...	...	...	...	...	40
	Artist	..	..	...	...	...	...	...	...	42
	Architect	..	..	...	...	...	...	...	...	50
	Mean	..	..	...	...	...	...	...	...	44.0
Group X		59	50	46	44	50	56	47	46	52
Group IX		..	..	46	...	52	59	...	51	...
Group V		..	..	...	48	...	...	50	...	...
Group I		..	..	...	...	...	...	...	...	52

* In every case Group X Score was second highest. Occupational scores are given only in two highest scoring groups.

guidance would cause a student to consider both alternatives without attempting a final answer, for differences of only a few standard scores cannot be accepted as conclusive.

Several of the more serious disagreements in the two systems of scoring are reported in Table 47. Of nine students who scored highest in personnel manager, four scored highest also in Group V,

TABLE 47

ALL OCCUPATIONAL SCORES ABOVE 39 OF FIVE STUDENTS WHOSE HIGHEST OCCUPATIONAL SCORE WAS PERSONNEL BUT WHOSE HIGHEST GROUP SCORE WAS NOT GROUP V

Group	Occupation	No 89	No. 109	No. 194	No. 211	No. 265
V	Personnel manager	57	57	52	45	52
	Social science teacher	....	41	..	..	....
	Y.M C.A. physical director	41	....	..	..	....
	Mean	49.0	49.0	..	..	....
VIII	Accountant	48	57	43	..	....
	Office man	41	57	..	..	....
	Purchasing agent	....	41	..	..	....
	Banker	....	40	..	..	....
	Mean	....	48.8	..	..	....
IX	Sales manager	....	43	..	44	....
X	Advertising man	....	....	..	..	40
XI	President	....	....	..	41	....
II	Chemist	46	....	..	..	46
	Engineer	42	....	..	..	43
	Mean	44.0	....	..	..	44.5
III	Production manager	45	43	42	42	40
IV	Mathematics-science teacher	56	....	..	..	....
	Farmer	46	....	..	..	....
	Printer	44	....	..	..	....
	Carpenter	42	....	..	..	....
	Policeman	41	....	..	..	....
Group V		47	43	45	32	38
Group VIII		....	58	..	36	....
Group IX		....	....	..	39	....
Group X		....	....	..	37	43
Group I		....	....	..	..	45
Group II		48	....	46	38	47

which is as it should be. Of the remaining five students four did not score highest in Group V, and one, No. 109, tied for personnel manager, accountant, and office man and scored highest in Group VIII. In all these five cases guidance might very well lead to different conclusions when based upon occupational or group scales. As pointed out in chapter 8, personnel manager does not quite meet the minimum requirements for assignment to Group V; and the data in Table 42 confirm this, for only 48 per cent of personnel managers obtain an A rating on the Group V scale and 23 per cent obtain B—, C+, and C ratings.

All of these data indicate that in four out of five cases a college student will score highest in an occupation which belongs to the group in which he scores highest. In many of the remaining cases the differences in scores between the two systems are not serious from a guidance point of view, but there are some cases where real differences in guidance will result. The differences in Table 47 are to be charged, however, not against the theory of group scales but against the assignment of personnel manager to Group V.

CALCULATION OF SCORES FROM "PRIMARY" INTERESTS

Given the factors from factor analysis it seems reasonable to suppose that blanks might be scored in terms of the four or five primary factors and scores for the occupations calculated from these primary factors by multiple correlation. One objection at the present time to doing this is that no one has as yet succeeded in developing scales to measure directly these "primary" interests. A second objection is that there is no proof that these four or five primary traits are anything more than co-ordinates in terms of which it is possible to locate occupations in four- or five-dimensional space.

Dwyer[8] made a factor analysis of scores on 19 occupational scales and selected the four occupations of physicist, journalist, minister, and life insurance salesman as "fundamental" occupations. These four were substitutes for the four primary factors,

[8] P. S. Dwyer, "An Analysis of 19 Occupational Scores of the Strong Vocational Interest Test Given to 418 Students Entering the University of Michigan Medical School during the Years 1928, 1929, 1930," *Journal of Applied Psychology* (1938), 22, 8–16.

since, as pointed out above, there is no way of scoring for such factors today. According to his intercorrelations these four occupations correlated between .17 and —.27 with each other, except for physicist and life insurance salesman, where the coefficient was —.65. From the experience of the writer with a much larger list of scales to select from, it is impossible to find four occupations with intercorrelations approximating zero.[4] Dwyer's list is probably as good as could be obtained, even though two scales measured much the same thing. Dwyer's "justification for this selection lies in the fact that, for most of the occupations, the multiple correlation coefficient predicted from these four fundamental occupations, ... is not much less than the square root of the communality." The significance of this statement is that, according to Roff,[5] the square root of the communality is the maximum value attainable by multiple correlation when the occupational score is predicted from all the other occupations, not merely from the four "fundamental" ones.

Dwyer summarizes his study as follows: "It was possible to predict the majority of the occupations with a multiple correlation of .80 or better. The occupations of farmer and C.P.A. alone resulted in a multiple correlation below .70."

It is well to know from a theoretical point of view that this can be done. It is entirely possible that practical use can be made of this finding by introducing some additional feature to the procedure. But as the procedure now stands it is not practical for two reasons: First, occupational scores can be obtained by machine scoring with no less trouble than with calculations involving multiple correlation. Second, and far more important, the multiple correlation scores will correlate ".80 or better" in only the majority of cases with the results obtained by use of occupational scales. There is here introduced unnecessarily a considerable amount of additional error to the error that already resides in the scales. The most important consideration in all testing is securing high reliability and validity. Anything that lowers either of these should be strictly abhorred.

[4] See p. 322.

[5] M. Roff, "Some Properties of the Communality in Multiple Factor Theory," *Psychometrika* (1936), 1, 1-6.

Thomson has already pointed out the undesirability of such a procedure, saying:

> when vocational guidance proceeds by giving to a candidate a number of tests which have previously been given to persons already engaged in the occupation, the use of factors has no mathematical justification whatever.[6]

To this Thurstone agrees.[7] If short cuts are to be employed, instead of using the specific occupational scales, it seems far preferable to utilize group scales than to attempt to calculate scores by multiple correlation.

Several interest inventories now used for vocational guidance are scored, not for interest in a given occupation or group of occupations, but for interest in a general factor, such as, academic, scientific, professional, computational, and the like. Although the writer has accumulated considerable data as to how these various interest tests compare with one another and particularly as to how they compare with the *Vocational Interest Blank*, he has not enough data to settle many questions and for that reason has omitted the subject here. The recent article by Gordon and Harkness compares the scores of fifty high-school boys scored on seven different interest tests. Correlations are reported ranging from .74 to —.03 between group scale scores of the *Vocational Interest Blank*, and scores on the other six sets of scales. Their conclusion is:

> . . . . the interest scales in different blanks are really measuring related but somewhat different traits, regardless of apparent similarity in names; otherwise our correlation coefficients would more nearly approximate the reliability coefficients reported by the various authors.[8]

[6] G. H. Thomson, "Some Points of Mathematical Technique in the Factorial Analysis of Ability," *Journal of Educational Psychology* (1936), **37**, 53.

[7] L. L. Thurstone, "Current Issues in Factor Analysis," *Psychological Bulletin* (1940), **37**, 216–17.

[8] H. C. Gordon and W. W. Harkness, Jr., "Do Vocational Interest Questionnaires Yield Consistent Results?" *Occupations* (1942), **20**, 424–29. See also in this connection I. R. Beiman, J. G. Darley, and D. G. Paterson, "Vocational Interest Scales," *University of Minnesota Employment Stabilization Research Institute*, August 1934, Vol. III, No. 5, and R. N. Anderson, "A Comparative Study of Three Vocational Interest Tests," *The Psychological Clinic* (1933), **22**, 117–27.

Part Three

INTEREST FACTORS

Whether there are general or only specific interests remains to be determined. In a search for general interests it has been established that men in the upper and lower socio-economic levels can be differentiated in terms of interests; the same is true of men and women, and of 15-year-old and 25-year-old men. Three interest scales have been developed to measure these three contrasting sets of interests, as reported in chapters 10 to 12.

As the changes in interests between 15 and 25 years are of concern in the development of guidance based on interests, the subject has been given especial attention in chapter 13 as well as in chapter 12. The former chapter gives a grouping of interests not considered elsewhere which may prove to be useful in the search for general interests.

Chapter 14 considers general interests in the light of factor analysis and the relationship of interest scores to scores on ability, attitude, and personality tests.

Chapter 10. Occupational-Level Scale

Occupations may be arranged in a hierarchy[1] in terms of the average intelligence of the individuals engaged in each. Can we find a rank order of occupations in terms of interests? If so, are the two hierarchies similar or different?

A related question is this: How do the interests of workmen compare with the interests of business and professional men? Are they distinct? Or are the interests of each function in business and professional life to be found among workmen performing these functions but at a lower level? For example, are the differential interests of engineers entirely distinct from those of any kind of workmen or are they related to the interests of workmen who are directly concerned with the development and maintenance of production processes, such as tool makers, machinists, and the like?

In order to throw some light on these questions, the occupational level (OL) scale was constructed. It affords an opportunity to measure the interests of men in all occupations on a single scale ranging from unskilled workmen, on the one hand, to business and professional men, on the other hand.

DEVELOPMENT OF OCCUPATIONAL-LEVEL SCALES

The occupational-level scale contrasts the interests of unskilled men with those of business and professional men earning approximately $2,500 a year and upward.[2] The scale was constructed in

[1] See for example J. Loevinger, "Intelligence as Related to Socio-economic Factors," *Thirty-ninth Yearbook of the National Society for the Study of Education* (Part I, 1940), chapter v.

[2] About one-fifth of families have incomes of over $2,000; about one-seventh have incomes of over $2,500. We use $2,500 not as an exact figure but as a convenient way of referring to the upper strata economically speaking. See *Consumer Incomes in the United States: Their Distribution in 1935–36* (National Resources Committee, 1938), p. 18.

the same manner as occupational scales, except that here the two criterion groups were contrasted with each other. These two criterion groups represent the upper and lower levels of occupations; they are actually subgroups of our 1,000 men which have been carefully selected to represent the male population of the United States between the ages of 18 and 60 years (see Table 186, p. 704).

The unskilled criterion group.—The composition of the unskilled criterion group is given in the first section of Table 186, which is made up of vocational interest blanks from 258 unskilled men. This group has been selected to conform not only to occupational distribution but also to age distribution according to the census (see Table 188). There is close agreement in terms of age, as can be seen by reference to the table and by the fact that the average age of unskilled men according to the census is 35.0 years and according to our sample it is 34.2 years.

A serious attempt was made to secure a sampling equal to the census in terms of amount of education as well as in terms of occupation and age. But here we found to our surprise that there were no data available as to the amount of education men in various occupations had had. Nor were there data regarding the broader classifications of unskilled, semiskilled, and skilled men. Putting together such data as were available, admittedly influenced to an unknown degree by guessing, we arrived at the following: workmen aged 40 to 60 years have had 7 years of schooling, those 30 to 39 years 7.3 years of schooling, those 25 to 29 years 7.6 years of schooling, and those 18 to 24 years of age have had 9 years of schooling. The corresponding data for our sample are: 40 to 60 years of age 9.7 years of schooling, 30 to 39 years 9.7 years of schooling, 25 to 29 years 10.7 years of schooling, and 18 to 24 years of age 10.9 years of schooling. Our sample averages 10.1 years of schooling instead of the estimated average of 7.6 years, a difference of 2.5 years of schooling. (See Table 189, p. 710.)

Business-professional criterion group.—The second criterion group for the OL scale is the men-in-general group (P_1) employed in the development of occupational scales, previously discussed. It is a sample of the occupations which earn $2,500 or more a

year.[3] Its composition is given in Table 190, page 712. It is actually a subgroup of P_2, as can be seen by comparing Tables 190 and 186, but the weighting of occupations as given in the latter table has been modified so as to represent occupations which earn $2,500 or more a year. In certain cases our calculations are admittedly no more than guesses, but a variation of a few per cent one way or the other can have very little effect upon the total.

Alternate occupational-level scales.—Some light is thrown on the characteristics of the occupation-level scale by consideration of earlier attempts to develop such a scale.

At the beginning of this study there was no way of knowing whether or not the interests of unskilled men could be differentiated from those of either business or professional men. It was entirely possible that the former differed from the latter in terms of intelligence but that in the realm of interests there were men at every occupational level who had the same interests, as, for example, semiskilled mechanics, machinists, and graduate engineers. Also, provided it was possible to differentiate the unskilled from business and professional men in terms of interests, it was not known whether it could be done best by contrasting business men with the unskilled, or professional men with the unskilled, or business and professional men combined with the unskilled. In other words, it was not known whether the interests of professional men fall between those of business men and unskilled workmen, or the other way around, or third, whether the three groups might fall as it were at the three corners of a triangle instead of on a linear scale. Accordingly, three scales were prepared contrasting the interests of (1) professional men and unskilled workmen; (2) business men and unskilled workmen; (3) professional and business men combined and unskilled workmen. (This is the scale which has been adopted for use.)

The composition of the unskilled criterion group has already been described. The composition of the professional-and-business-

[3] Davidson and Anderson have demonstrated that income varies greatly at all occupational levels and that some men of low status earn more than men of much higher occupational status. The distinction between the two criterion groups is one of occupations not men. A criterion in terms of men would in some respects be better, but there is no way available to us of securing the necessary data. See footnote 18 on p. 209.

combined criterion group for the third of these scales is similarly given in Table 190, page 712. The professional-men criterion group for the first of these scales is given in the first half of Table 190, and the business-men criterion group for the second scale is set forth in the second half of this table.

The three scales having been constructed, 300 blanks equally divided among unskilled, semiskilled, skilled, foreman, office man, business man, and professional man were scored on the three scales. The data are given in Table 48. Approximately the same results are obtained by use of the three procedures, except that quite naturally professional men scored higher on their own scale than did business men, with the situation reversed on the business executives scale. The data indicate that the interests of professional men are more unlike the interests of unskilled men than is the case with business men.

TABLE 48

RAW SCORES ON THE THREE PROVISIONAL OL SCALES

(N = 50 in each case)

Occupational Group	Unskilled Compared with Other Groups								
	Professional			Business			Professional and Business		
	Av.	σ	C.R.[a]	Av.	σ	C.R.[a]	Av.	σ	C.R.[a]
Unskilled	−32.2	66.5	....	−18.2	57.0	...	−15.4	58.3	....
Semiskilled	−30.6	79.9	.1	−14.8	72.2	.3	−12.0	73.7	.3
Skilled	−4.2	70.9	2.0	6.4	58.3	2.1	11.4	59.9	2.3
Foreman	1.8	72.6	2.4	27.2	67.7	3.6	28.8	68.4	3.5
Office man	28.4	71.6	4.4	41.4	62.9	5.0	47.6	60.7	5.3
Business man	63.2	56.1	7.8	84.2	57.5	8.9	84.6	55.8	8.8
Professional man	116.6	63.3	11.5	81.0	51.3	9.2	101.0	52.2	10.5

[a] Critical ratios between unskilled and other groups.

Three hundred blanks equally divided among accountants, artists, certified public accountants, physicians, mathematicians, and city school superintendents were also scored upon the three scales. The data here also confirmed the results obtained above, namely, all three scales gave approximately the same results. It was accordingly concluded that an interest scale designed to measure occupational levels should contrast the interests of un-

skilled men with the interests of business and professional men combined.

It may be argued that in combining business and professional men they should be weighted equally. Such a point of view can be well defended. We have, however, chosen to weight them according to their occurrence in the male adult population as based on census data. This is set forth in Table 186, page 704. This provides that business men are weighted twice as much as professional men. Despite this fact it is worthy of note that the professional men average higher on the third scale than do business men.[4]

NORMS FOR OL SCALE

The distribution of OL scores of our 1,000 men based on the census is given in Table 49. The mean raw score is 18.1; sigma is 73.62. Standard scores are calculated from the data above. Both raw and corresponding standard scores are given in the table. The reliability of the scale is .875. Permanence over five years is .72 and over ten years, .63, which coefficients are somewhat less than the average of all occupational scales (see Table 95, p. 360).

The range of individual scores for the 1,000 men is from 80 to 20 standard scores. The range of college students is much less, i.e., from 73 to 35.

Distributions of scores for subdivisions of the 1,000 men indicate that there is a great deal of overlapping among all subdivisions. Only 18 per cent of professional men and 11 per cent of managers-owners score higher than the unskilled man who scores highest in his subdivision, and only 13 per cent of unskilled men score lower than the manager-owner who scores lowest in his subdivision.

We suspect that our sampling is not so good as it should be for the lower grades of workmen. The average education, as pointed out above, is too high. But more important here is the lack of data from men with very little education—such men cannot or will not fill out the blank. The 90 construction laborers among our 258

[4] Further experimentation suggests that the relationships between the interests of unskilled, business, and professional men may be described by a triangle with sides of approximately 1 between business and professional, 2 between business and unskilled, and 2½ between professional and unskilled.

TABLE 49

DISTRIBUTION OF OL SCORES FOR SUBDIVISIONS OF 1,000 MEN

Raw Score	Standard Score	Unskilled	Semi-skilled	Skilled	Foreman	Clerical	Salesman	Managers-Owners	Professional	Unemployed	Total
240	80	..	..	..	..	..	..	1	..	..	1
230	79	..	..	..	..	..	..	0	..	..	0
220	77	..	..	..	..	..	..	0	..	..	0
210	76	..	..	..	..	..	..	0	..	..	0
200	75	..	..	..	..	..	1	3	..	..	4
190	73	..	..	..	..	..	0	1	1	..	2
180	72	..	..	..	..	.	0	2	1	..	3
170	71	..	..	..	..	1	1	5	1	..	8
160	69	..	..	..	..	1	1	4	1	1	8
150	68	..	..	..	..	1	0	4	0	1	6
140	67	1	..	..	..	1	2	5	4	1	14
130	65	0	1	2	..	1	1	8	4	1	18
120	64	1	1	1	1	4	2	12	3	1	26
110	62	1	1	0	0	1	7	6	3	1	20
100	61	1	0	2	0	2	2	14	1	2	24
90	60	3	3	6	0	1	6	12	4	4	39
80	58	6	3	5	2	1	4	7	3	2	33
70	57	7	4	3	2	1	5	8	3	2	35
60	56	9	5	4	0	4	8	9	1	3	43
50	54	6	9	6	1	4	3	15	5	3	52
40	53	7	9	5	1	8	2	9	1	2	44
30	52	15	17	5	0	6	3	10	0	9	65
20	50	15	7	9	0	5	2	11	1	3	53
10	49	15	8	14	1	1	4	13	0	5	61
0	48	8	10	6	1	0	0	7	1	4	37
−10	46	12	15	6	0	1	1	9	1	1	46
−20	45	24	10	5	0	5	1	4	..	4	53
−30	43	10	6	9	1	3	4	2	..	3	38
−40	42	16	10	9	0	1	1	8	..	2	47
−50	41	14	7	3	1	0	3	6	..	0	34
−60	39	14	4	3	1	0	0	6	..	3	31
−70	38	10	7	3	2	1	1	4	..	1	29
−80	37	12	9	6	0	0	0	2	..	0	29
−90	35	15	7	4	0	0	1	2	..	0	29
−100	34	7	6	0	1	0	..	3	..	1	18
−110	33	6	1	4	..	0	..	..	..	..	11
−120	31	5	4	1	..	0	..	..	..	..	10
−130	30	3	1	0	..	1	..	..	..	..	5
−140	29	5	0	1	..	..	..	..	..	..	6
−150	27	5	4	..	..	..	..	..	..	..	9
−160	26	1	2	..	..	..	..	..	..	..	3
−170	24	0	2	..	..	..	..	..	..	..	2
−180	23	2	..	..	..	..	..	..	..	..	2
−190	22	1	..	..	..	..	..	..	..	..	1
−200	20	1	..	..	..	..	..	..	..	..	1
Total		258	173	122	15	55	66	212	39	60	1000
Standard score											
Mean		44.5	45.9	48.3	49.0	54.4	56.2	55.3	61.7	52.4	50.0
σ		8.7	8.5	8.0	9.1	8.4	8.8	9.9	6.0	7.8	10.0

unskilled men average 47.1, which is 2.7 standard scores above the mean for the 258. Twenty-five additional records each of electricians, machinists, and mechanics give mean scores, respectively, of 50.3, 46.5, and 44.3. Seemingly the mean score for machinist is too low in comparison with construction laborer and mechanic. But these skilled trades are located approximately at 48.3, the mean score for skilled workmen (see data in Tables 49 and 50).

At first thought foremen seem to have too low a score and it is possible a better sampling will give a different mean score. But foremen are usually selected from among the better skilled workmen, and so their score might be expected to differ only slightly from skilled men, as it does in the table. The higher score of professional men than managers and owners has been commented on before.

DIFFERENTIATION OF OCCUPATIONS IN TERMS OF OL SCALES

The mean standard scores and standard deviations of 36 occupations and five related groups are reported in Table 50, based all told on the records of 9,904 men. It is evident that there is a definite progression in scores from unskilled to semiskilled and to skilled men and from there upward to the broader and more executive types of business activities and the professions. In terms of critical ratios the skilled trade which scores lowest on the scale—carpenter—averages significantly higher than unskilled workmen. In other words, all occupations from the skilled trades upward average significantly higher on the scale than unskilled laborers.

Correlations between scores on occupational scales and the OL scale are given in the last column of the table. These correlate with mean OL scores (column one of table) .865. It is occupational groups VII (C.P.A.), IX (sales), X (advertising, etc.), and XI (president) that correlate high, and groups IV (farmer, etc.) and VI (musician) that correlate low with OL.

It is interesting to note that high-school juniors average only 0.7 standard score above the mean for the 1,000 men, while 62 men (itinerants) who spent a night in the Palo Alto "Shelter" in 1931 average 1.6 below that mean and 100 boys in a C.C.C. camp average 3.7 below the mean, that is, at the level of semiskilled men.

TABLE 50

MEAN SCORES OF OCCUPATIONS ON OCCUPATIONAL-LEVEL SCALE*

N	Occupation	Standard Score	Sigma	Comparison with Unskilled: Critical Ratio of Difference of Means	Comparison with Unskilled: Percentage Overlapping[a]	Correlation with OL
251	Lawyer	64.4	6.9	28.5	20.4	.60
168	Advertiser	63.8	7.7	24.0	24.1	.52
169	President	63.4	7.2	24.4	23.5	.63
354	Certified public accountant	63.4	7.0	28.7	23.0	.43
190	City school superintendent	63.4	7.0	25.4	22.9	.10
228	Sales manager	63.3	7.4	25.6	24.5	.42
249	Author-journalist	63.0	6.2	27.6	21.5	.46
315	Life insurance salesman	62.3	7.5	25.8	27.4	.47
181	Mathematician	61.5	6.3	23.6	26.0	—.13
147	Personnel	61.4	7.1	21.1	28.8	—.10
513	Engineer	61.4	6.7	27.2	27.6	—.20
337	Physician	61.3	7.4	24.7	29.9	.03
241	Architect	61.0	6.4	24.2	27.6	—.03
173	Physicist	61.0	6.2	22.9	27.0	—.17
188	Psychologist	60.9	6.4	22.8	28.0	—.14
243	Real estate salesman	60.4	7.5	22.0	32.6	.41
216	Production manager	60.2	8.4	19.8	36.3	—.23
297	Chemist	60.0	7.0	22.8	32 5	—.28
219	Purchasing agent	60.0	6.6	22.0	31.2	.01
345	Accountant	59.5	7.5	22.1	35.7	—.26
113	Y.M.C A. secretary	59.4	7.2	17.1	35.3	—.18
232	Artist	58.9	6.6	20.7	34.8	.18
250	Minister	58.8	6.1	21.5	33.5	—.14
247	Banker	58.1	8.0	18.3	41.7	.05
239	Dentist	57.7	7.4	18.1	41.5	—.24
585	Osteopath	57.6	6.9	21.6	39.8	—.32
317	Office worker	57.0	7.5	18.2	44.2	—.33
405	Forest service	56 4	6.8	18.6	44.0	—.62
217	Social science teacher	56.1	6.5	16.5	45.0	—.21
215	Y.M.C.A. physical director	55.8	7.4	15.2	48.4	—.49
241	Farmer	55.7	8.9	14.1	52.9	—.61
237	Mathematics-science teacher	55.0	6.5	15.2	49.3	—.72
510	Aviator	54.3	6.4	16.2	51.4	—.59
250	Musician	53.8	7.2	13.0	56.3	—.42
279	Printer	51.5	7.1	10.0	66.1	—.82
100	High-school juniors	50.7	8.2	6.2	71.9	...
254	Policeman	50.0	7.4	7.6	73.6	—.77
181	Carpenter	48.5	8.0	4.9	81.3	—.72
62	Palo Alto Shelter	48.4	9.3	2.9	83.3	...
100	C.C.C. camp	46.3	8.2	1.8	91.7	...
173	Semiskilled	45.9	8.5	1.6	93.7	...
258	Unskilled	44.4	8.7	...	...	...

* Table 87, page 324, presents these data with occupations classified in their groups.

[a] Total overlapping (see page 110).

TABLE 51

PERCENTILES ON OCCUPATIONAL-LEVEL SCALE FOR SEVERAL OCCUPATIONS

Equivalent Raw Scores	Standard Scores	255 Unskilled	173 Semi-skilled	181 Carpenter	254 Policeman	279 Printer	250 Musician	237 Mathematics-Science Teacher	405 Forest Service	239 Dentist	232 Artist	216 Production Manager	181 Mathematician	249 Author-Journalist	251 Lawyer
251	82	..	..	..	..	..	..	..	..	..	..	..	..	..	99
236	80	..	..	..	..	..	..	..	..	99	..	..	99	99	99
221	78	..	..	..	..	..	..	..	..	99	..	99	99	99	99
206	76	..	..	..	..	..	..	99	..	99	..	98	99	99	95
191	74	..	..	..	..	..	..	99	99	98	99	95	98	96	89
177	72	..	..	99	..	99	99	99	99	96	98	92	97	91	84
162	70	..	..	99	99	99	99	98	99	95	96	88	91	84	76
147	68	99	99	98	99	99	98	98	96	91	90	83	83	74	65
133	66	99	99	98	98	98	95	94	92	84	86	76	73	66	56
118	64	99	99	97	96	96	92	90	87	79	79	62	59	54	44
103	62	98	98	96	94	93	88	83	78	69	64	53	45	39	33
88	60	96	96	92	88	89	78	76	65	58	50	42	35	29	24
74	58	93	94	88	84	82	68	67	54	49	39	35	28	18	16
59	56	89	90	81	75	70	55	56	43	36	26	27	17	11	10
44	54	85	82	73	68	61	47	44	31	27	18	20	11	6	6
29	52	77	68	66	61	52	37	34	21	21	12	14	8	2	4
15	50	68	62	55	49	40	27	19	15	16	8	11	6	2	2
0	48	63	53	43	35	32	19	9	11	9	5	8	3	1	1
−1	46	53	43	36	26	22	14	6	8	6	4	6	..	1	1
−16	44	46	38	27	21	14	9	3	5	3	2	5	..	..	1
−30	42	36	29	18	13	8	6	3	3	2	1	3	..	..	..
−45	40	29	24	10	8	5	3	1	1	1	1	2	..	..	..
−60	38	22	17	7	5	2	2	..	1	1	..	1	..	..	..
−75	36	15	12	4	2	1	1	..	..	..	..	1	..	..	..
−89	34	10	8	2	..	..	1	..	..	..	..	..	..	..	..
−104	32	7	6	2	..	..	..	..	..	..	..	..	..	..	..
−119	30	5	5	1	..	..	..	..	..	..	..	..	..	..	..
−134	28	2	3	1	..	..	..	..	..	..	..	..	..	..	..
−148	26	2	1	..	..	..	..	..	..	..	..	..	..	..	..
−163	24	1	..	..	..	..	..	..	..	..	..	..	..	..	..
−178	22	..	..	..	..	..	..	..	..	..	..	..	..	..	..
−192	20	..	..	..	..	..	..	..	..	..	..	..	..	..	..

Table 51 gives the percentiles for fourteen of the occupations listed in Table 50. This table illustrates the very great overlapping between occupations but at the same time a steady rise in median scores from unskilled workman to lawyer.

Corresponding data for high-school juniors and college freshmen and seniors are given in Table 52.

TABLE 52

PERCENTILES ON OCCUPATIONAL-LEVEL SCALE FOR HIGH-SCHOOL AND COLLEGE STUDENTS

Standard Scores	High-School Juniors	College Freshmen	College Seniors
72	..	99	99
70	99	99	98
68	99	97	95
66	97	94	91
64	93	90	85
62	88	84	77
60	85	74	65
58	82	62	55
56	70	47	38
54	66	39	29
52	49	28	19
50	41	20	12
48	28	8	9
46	21	7	5
44	19	5	3
42	11	2	1
40	5	1	1
38	4	1	1
36	3	1	1
34	2	..	..
32	2	..	..
30	1	..	..
28	1	..	..
N	160	306	285
Mean	51.3	55.3	56.9
σ	7.8	6.5	6.6

Occupations are not so well differentiated by the OL scale as by specific occupational scales. The range of mean scores of occupations on the OL scale is but 19.0 standard scores,[5] whereas the average of such ranges for four occupational scales is 34, or 80 per cent greater (see Table 53). The critical ratio of the difference

[5] It is 19.0 according to Table 53. When lawyer is included, the range is 20.0, as in Table 50.

in mean scores on the OL scale of the two occupations with highest and lowest mean scores in Table 53 is 12.0, which is considerably less than the average of critical scores for corresponding differences on four specific occupational scales, i.e., 20.5.

TABLE 53

MEAN SCORES OF SEVERAL OCCUPATIONS ON OL AND FOUR OCCUPATIONAL SCALES

Occupational Group	Occupational-Level Scale		Physician Scale		Artist Scale		Accountant Scale		C.P.A. Scale	
	Mean	σ	Mean	σ	Mean	σ		σ	Mean	σ
Professional men	61.3	7.1	36	13.3	29	12.3	31	12.3	30	13.1
Business men	59.0	7.6	24	9.9	20	10.3	26	13.7	23	11.3
C.P.A.	63.4	7.1	28	9.9	22	12.4	43	12.3	52	7.4
City school superintendent	63.4	6.9	29	10.9	21	10.6	28	9.6	27	7.8
Mathematician	61.5	6.4	42	9.4	32	10.0	26	8.6	34	7.1
Physician	61.3	7.3	48	10.4	32	10.6	21	9.3	26	8.8
Accountant	59.5	7.5	19	7.2	14	7.7	52	8.9	35	8.8
Artist	59.0	6.7	45	8.9	49	9.3	13	7.5	24	7.8
Office man	57.0	7.5	24	11.1	20	10.9	39	12.7	28	13.1
Foreman	49.0	9.1	26	9.2	15	9.3	38	11.3	22	9.5
Skilled	48.3	8.0	30	10.4	23	10.6	30	11.0	18	8.1
Semiskilled	45.9	8.6	28	9.9	23	11.5	30	11.3	20	9.5
Unskilled	44.4	8.7	29	10.6	24	12.3	31	12.3	21	8.1

SIGNIFICANCE OF AN OL SCORE

Men cannot be assigned to a specific occupation on the basis of intelligence-test scores. Neither can they be assigned to a specific occupation in terms of an occupational-level score. In both cases there is far too great overlapping between occupations to make this possible. Nevertheless such assignments can be made in a general way: Men with high OL scores have the interests of business executives and professional men, but those with low scores have the interests of workmen.

Table 54 presents the situation. In the center of the table are listed various occupations at the OL level of their respective mean scores. At the extreme right are shown the chances that a man with a certain OL score has of being included in various occupations. For example, a score above 62 means less than 10 per cent chance of having the interests of a skilled workman and practically no

TABLE 54

SIGNIFICANCE OF AN OCCUPATIONAL LEVEL SCORE

Standard Scale	Chances in 100 That a Chance Score Will Exceed This Score	Average Score of Occupation	Distribution of Scores
66	..		Above 66. Less than 10% belong to an occupation below banker and dentist
64	..	Lawyer, advertiser	
63	..	President, C.P.A., city school superintendent, sales manager, author-journalist	
62	..	Mathematician, life insurance salesman	Above 62. Less than 10% are skilled
61	..	Personnel manager, engineer, physician, architect, physicist, psychologist	
60	..	Realtor, production manager, chemist, purchasing agent, accountant	
59	..	Y.M.C.A. secretary, minister, artist	
58	..	Banker, dentist	
57	..	Office worker	
56	..	Forest service, social science teacher, Y.M.C.A. physical director, farmer	Above 56. Less than 10% are unskilled or semiskilled
55	..	Mathematics-science teacher	
54	1	Musician, aviator	
53	3		
52	6	Printer	
51	12		
50	22	Policeman	
49	36	Carpenter	
48	48[a]		(Av. Chance Score is 48.1) Below 48. Less than 10% of occupations above skilled trades
47	33[a]		
46	20[a]	Semiskilled	

TABLE 54 (*Concluded*)

Standard Scale	Chances in 100 That a Chance Score Will Exceed This Score	Average Score of Occupation	Distribution of Scores
45	11[a]		
44	5[a]	Unskilled	
43	2[a]		
42	1[a]		
41	..		
40	..		Below 40. Less than 10% of skilled
39	..		
38	..		
34	..		Below 34. Less than 10% of unskilled and semiskilled
30	..		Below 30. Less than 5% of unskilled and semiskilled

[a] Chances in 100 that a chance score will fall below this score.

chance of having the interests of a semiskilled workman. Such a score is obtained by 2 per cent of unskilled and semiskilled, by 10 per cent of skilled, by 22 per cent of forest service men, by 36 per cent of artists, by 55 per cent of mathematicians, and by 67 per cent of lawyers. On the other hand, a score of 40 is indicative of less than skilled trade level. (From our data 5 per cent of printers, 10 per cent of carpenters, 24 per cent of semiskilled and 29 per cent of unskilled score below 40.) Practically all men above the level of skilled tradesman score above 40.

The mean OL score based on chance is 48.1. The figures in the second column of the table express the probability that certain OL scores could be obtained by chance.[6] Thus there are six chances in one hundred of scoring 52 and above or 44 and below. Scores above and below these limits may be viewed with much greater certainty than those within this range.

[6] See p. 86 for discussion of chance scores on the scales.

Age and OL scores.—Four groups of data regarding the relationship of age to OL scores are given in Table 55. The fifteen-year-old group is an excellent sampling of boys of this age (see Table 191, p. 715). Their mean OL score is 47.0, three standard scores below the mean for our 1,000 men. The data for the 1,000

TABLE 55

AGE AND OL STANDARD SCORE

Age	15-Year-Old			Through Office			Age	1,000 Men			258 Unskilled		
	N	Mean	σ	N	Mean	σ		N	Mean	σ	N	Mean	σ
15....	424	47.0	8.1	21	47.8	9.0	.....	...	....	....	..	....	....
16....	...	....	...	56	49.2	9.0	.....	...	....	....	..	....	....
17....	...	....	...	200	46.3	9.0	.....	...	....	....	..	....	....
18....	...	....	...	200	47.9	8.2	.....	...	....	....	..	....	....
19....	...	....	...	200	49.5	8.6	.....	...	....	....	..	....	....
20....	...	....	...	200	50.3	8.0	.....	...	....	....	..	....	....
21....	...	....	...	200	51.0	7.3	18–24..	205	49.1	9.4	74	43.5	8.7
22....	...	....	...	136	51.0	7.2	.....	...	....	....	..	....	....
23....	...	....	...	90	50.7	7.7	.....	...	....	....	..	....	....
24....	...	....	...	68	51.6	8.1	.....	...	....	....	..	....	....
25....	...	....	...	41	52.4	6.6	.....	...	....	....	..	....	....
26....	...	....	...	...	....	...	.....	...	....	....	..	....	....
27....	...	....	...	...	....	...	25–29..	169	50.4	9.3	46	44.6	7.4
.....	...	....	...	...	....	...	30–34..	131	50.2	10.4	35	46.0	7.6
.....	...	....	...	...	....	...	35–39..	144	49.4	10.8	38	44.6	8.8
.....	...	....	...	...	....	...	40–44..	107	51.3	10.4	19	46.7	8.7
.....	...	....	...	...	....	...	45–49..	106	49.8	10.1	23	44.4	8.6
.....	...	....	...	...	....	...	50–54..	77	50.8	10.9	13	41.7	10.6
.....	...	....	...	...	....	...	55–59..	61	51.3	10.2	10	46.7	9.2
Total	424	47.0	8.1	1,412	49.5	...	.....	1,000	50.0	10.0	258	44.6	....

men is given in the third section of the table. There is very little variation in score at different ages—a smoothed curve shows a rise from 49.1 at 21 years of age to 50.5 at 52.5 years of age. Such a difference is small in amount but has a critical ratio of about 3.0. Data in the second section of the table have been taken from blanks scored in our office—mostly high-school and college students. Here there is an increase in score from 47.8 to 52.4 corresponding to an increase in age from 15 to 25 years and a considerable increase in educational attainment. The data in Table 116 (p. 418) indicate that college men of about 21 years of age, preparing for four different professions, average 4.8 standard score lower than adult

men in these professions. If these data are taken at their face value they indicate increase in OL score with age. It is, however, possible that some of the younger group will not continue in their chosen profession and that they on the whole have lower OL scores than the remainder.

The data from 258 unskilled men in the fourth section of the table show no change in OL score from 21 to 57 years of age, since a smoothed curve is practically a straight line at the level of 44.6 OL score. The fact that this group averages 5.4 standard scores below the mean for the 1,000 men indicates that differences in socio-economic level affect OL scores much more than age and that the increase in OL scores in the "Through Office" groups is caused primarily by an increasingly higher selection of men. Certain it is that subdividing the 1,000 men on the basis of age (third section of Table 55) exhibits no such range of OL scores as result when the group is subdivided on the basis of socio-economic level as in Table 49.

Table 56 gives the OL scores of 1,708 men distributed by age from 25 to 64 years. Thirteen of the fifteen subgroups are engaged in administration work; the other two subgroups—district ranger and accountant—are included for certain comparisons discussed elsewhere. There is no evidence in this table of change in OL score with age except possibly from 57.5 to 62.5 years.[7] Since the latter group contains only twenty cases, this difference must be viewed with suspicion.

In studies of this sort the most unequivocal data are those involving two or more tests of the same individuals. Such data are reported in Table 195, page 720, for high-school juniors and in Table 196 for college freshmen and seniors and reproduced here:

Age	High-School Juniors	College Freshmen	College Seniors
16.5	51.3	....	....
18.5	....	54.8	....
19.5	....	54.8	....
22.5	51.8	....	57.8
27.5	....	57.7	59.2
32.5	....	....	59.0

[7] As a check, the mean scores at each age level were divided by the mean score of the subgroup and these percentages averaged for each age group. The averages are: 25 years, 101; 30 years, 98; 35, 101; 40, 99; 45, 100; 50, 98; 55, 98; 60, 107.

The high-school juniors increase their score 0.5 in six years, not a statistically significant difference. The college freshmen show no increase from 18.5 to 19.5 years but an increase of 2.9 in the next eight years. The college seniors exhibit an increase of 1.4 from 22.5 to 27.5 years and a decrease of 0.2 in the next five years. The total increase in OL score of both these college groups over nine to ten years is small but is statistically significant.

TABLE 56

OL SCORES DISTRIBUTED ACCORDING TO AGE OF 1,708 MEN MOST OF WHOM ARE ENGAGED IN ADMINISTRATIVE WORK

Classification		Age								Total[a]
		25	30	35	40	45	50	55	60	
District ranger	N	37	38	40	30	24	13	7	....	190
	M	55.9	54.4	55.3	56.2	55.1	50.1	58.4	....	55.1
Supervisor of forest service	N	....	18	17	11	20	12	12	....	100
	M	....	58.9	62.8	56.5	58.6	57.8	58.3	....	58.8
Asst. administrator forest service	N	....	....	....	....	3	10	1	3	17
	M	....	....	....	....	55.3	58.5	52.0	62.0	57.9
Administrator forest service	N	....	....	....	1	1	5	7	2	16
	M	....	....	....	57.0	62.0	59.0	68.4	62.0	64.1
Superintendent reform school	N	....	....	1	1	2	3	1	1	9
	M	....	....	62.0	57.0	62.0	57.0	52.0	62.0	58.7
Accountant	N	31	62	64	45	33	10	6	....	256
	M	62.5	58.3	58.8	58.2	58.1	56.5	60.3	....	58.9
Production manager	N	11	23	44	44	40	29	21	3	216
	M	63.8	60.9	61.4	60.4	60.0	57.0	57.7	67.0	59.7
Warden of prison	N	....	....	3	3	1	4	1	1	16
	M	....	....	57.0	58.7	67.0	58.3	62.0	62.0	60.4
Superintendent of hospital	N	....	....	4	14	10	7	9	2	46
	M	....	....	58.3	62.4	59.0	62.0	61.4	69.5	61.3
Personnel manager	N	10	13	47	28	21	20	7	....	147
	M	60.5	60.8	61.6	62.7	60.8	61.0	57.7	....	60.9
City manager	N	1	1	4	9	10	7	6	....	42
	M	57.0	57.0	64.5	65.3	62.5	55.6	57.0	....	61.5
Comptroller	N	5	14	23	11	12	2	2	....	70
	M	58.0	60.9	61.6	60.6	64.9	72.0	57.0	....	61.8
City school superintendent	N	....	9	28	41	42	39	30	1	190
	M	....	63.7	63.4	62.5	62.1	63.2	63.8	77.0	62.9
Sales manager	N	9	21	39	66	54	29	8	....	227
	M	67.0	59.9	64.4	63.3	63.2	64.4	58.9	....	62.8
President manufacturing company	N	2	9	15	26	33	43	29	7	166
	M	64.5	56.4	64.0	62.8	62.3	64.1	65.7	61.3	62.9
Total	N	106	210	329	328	315	233	147	20	1708
	M	60.3	58.6	60.9	61.0	60.7	60.6	61.4	64.0	60.6

[a] Twenty scattered cases below 25 and above 64 years not reported but included in totals.

All told, the evidence is conflicting. The follow-up data on high-school juniors show almost no change, whereas the remainder of our data indicates an increase of about 3.0 standard scores from 15 to 25 years. The follow-up data from college students indicates a slight increase in score between the ages of 18 and 32 years, whereas the remainder of our data suggest no appreciable change. The best conclusion is that a small increase of 2 to 3 standard OL scores may occur with increasing age. But it is obvious from all our data that age affects OL score very little in contrast to differences in socio-economic level.

Scholarship and occupational-level scores.—Approximately 140 students in the Graduate School of Business at Stanford University were divided into four groups on the basis of their scholastic grades for one year. The students in the upper fourth averaged 60.0 on the occupational level scale, the students in the lower fourth averaged 59.0. The difference is statistically insignificant, having a critical ratio of only 0.6. The average for all four groups is 59.5 —0.9 standard score higher than Stanford seniors ten years after graduation.

The following correlations were obtained in this study:

Grades *vs.* Occupational Level	.114
Grades *vs.* Thorndike Aptitude test[8] ...	.406
Occupational Level *vs.* Thorndike	.049

It is possible that some relationship may be found between scholarship and occupational level when the group studied averages lower both in intelligence and in occupational level, and particularly when there is less homogeneity in these respects.

Relationship to IM and MF.—Distributions of occupations in terms of the three factors of IM, MF, and OL are given in chapter 14, page 323. Discussion as to how OL is related to the other two special scales is reserved for that chapter.

Managerial responsibility and OL.—When occupations are listed in terms of their mean OL score, as in Table 50, we have also to a considerable degree a rank order in terms of managerial responsibility. There are, however, exceptions to such a relationship, such as advertiser, author, life insurance salesman, and

[8] Average score on Thorndike Intelligence Examination for High-School Graduates was 85. The median score at Stanford University a few years earlier was 79.

mathematician, who have high OL scores but exercise little managerial responsibility. OL cannot be said to measure managerial responsibility in general. Two sets of data indicate, however, that within the members of an occupation there is a tendency for those with greater managerial responsibility to have higher OL scores.

Table 56 gives the data for four groups of men in the United States Forest Service. District rangers have a few rangers under them; supervisors have charge of a forest with a considerable staff; assistant administrators report to the regional or Washington administrators; while the administrators are in charge of a region, composed of many forests, or control the operations of the entire service from Washington. District rangers have a mean OL score of 55.1 (σ is 7.1), which is 3.7 OL score less than that of the supervisors, who have a mean OL score of 58.8 (σ is 6.25). This difference is significant, having a critical ratio of 4.6. Supervisors score 5.3 below the administrators, with a critical ratio of 3.4. Although an assistant administrator receives a higher salary than a supervisor, he is not actually the head of an operating unit. This may explain the fact that their OL score is below that of the supervisors. (A larger sample of assistant administrators might also give a different mean score.) In any case there is a distinct increase in mean OL score from district ranger to supervisor to administrator. The increase in mean OL score is caused primarily by gradual elimination of low OL scores as we go up the scale from district ranger to administrator, as shown in Table 57. Such a condition is in harmony with our hypothesis, for there must be young men with high OL scores to be promoted later on and there must be an absence of low OL scores among the top managerial people.

The second set of data contrasts the mean OL scores of accountants with comptrollers. The former average 58.9 (σ is 7.54), the latter 61.8 (σ is 7.67), a difference of 2.9, which is almost but not quite statistically significant with a critical ratio of 2.8.

Significance of OL scores in guidance.—We cannot with certainty assign a man to a given occupation on the basis of his intelligence-test score; nor can we do so when we know his OL score. Both tests are useful, however, in guiding a man into the general level of activity for which he is best fitted.

Our data show that a considerable minority of young men score below 42 on the OL scale. For example, 15 per cent of our high-school juniors score in this low range. During the depression all the men in the Palo Alto Shelter on two occasions filled out the *Vocational Interest Blank* in lieu of an hour's work. Twenty-four per cent of the sixty-two men scored below 42. In a sample of one C.C.C. camp, 28 per cent scored below 42. As far as OL score goes, these minorities belong in unskilled and semiskilled occupations, possibly in the skilled trades. The wide range of OL scores for any given occupation or level of occupations (see Table 49) should warn us that some men with low OL scores are found in upper-level occupations and vice versa.

TABLE 57

DISTRIBUTION OF OL SCORES AMONG FOUR GROUPS OF MEN IN THE FOREST SERVICE

OL Score	District Ranger	Supervisor	Assistant Administrator	Administrator
36	6	..	..	..
40	8	1	1	..
44	13	5	..	..
48	24	7	2	1[a]
52	43	16	3	..
56	44	18	5	3
60	33	34	6	2
64	15	9	3	4
68	1	10	..	5
72	3	..	..	1
Number	190	100	20	16
Mean	55.1	58.8	57.9	64.1
σ	7.1	6.3	5.8	5.8

[a] This man is in charge of disbursements and might quite properly be omitted. If so the mean score for administrator is 65.5 and sigma is 4.8.

Most boys who go to high school and college expect better jobs than that of laborer and consequently reject guidance directing them toward semiskilled or skilled work. Even when the boy is acquiescent, his family is usually decidedly opposed to such a program. The result is a conflict between the boy's intrinsic interests and his notions of what he should expect backed up by his family's insistence upon his making good, i.e., entering a white-collar job. Consequently, a low OL score should warn a counselor to look for such conflicts. In a number of cases the writer has found college men with low OL scores and miserable scholastic records quite

ready to work in a garage with the idea of advancing to foreman and later to ownership. The writer has suspected the "ownership" was seized upon by the boy as a good excuse to the family as to why he should work in a garage. The conflict is much harder to resolve at the college level when the student has sufficiently high intelligence to do satisfactory scholastic work, even when the student admits he has no particular interest in his studies; for here the family accepts the good grades as evidence of future success.

Darley has defined occupational level as

> a quantitative statement of the eventual adult "level of aspiration," representing the degree to which the individual's total background has prepared him to seek the prestige and discharge the social responsibilities growing out of high income, professional status, recognition, or leadership in the community; at the lower end of the scale the individual's background has prepared him for the anonymity, the mundane round of activities and the "followership" status of a great majority of the population.[9]

He continues:

> Clinical experience together with limited experimental data would indicate that the lowest occupational level scores on the revised blank will accompany the interest type previously defined as "lower level jobs." Furthermore, an excessively low occupational level score seems at present to be associated with lack of "staying power" or "survival power" in college competition. This hypothesis should be tested as quickly as research data accumulate, by careful studies of matched groups, since it is a phase of the "level of aspiration" and general motivational problems.[10]

HIERARCHIES OF OCCUPATIONS IN TERMS OF INCOME, INTELLIGENCE, AND INTERESTS

Classification of occupations.—Occupations may be classified in a great many ways. Eight such classifications are mentioned here, for in all of them the occupations are arranged in an order-of-merit, or hierarchy, from best to poorest in some respect. The eight systems are:

1. Job classification or job evaluation, based on job analysis in which the jobs are arranged in levels according to the complexity of duties performed and qualifications required.[11]

[9] J. G. Darley, *Clinical Aspects and Interpretation of the Strong Vocational Interest Blank* (Psychological Corporation, 1941), p. 60.

[10] *Ibid.*, p. 66.

2. Abilities. Jobs or occupations arranged in levels according to the complexity of abilities required. Such a system is often discussed but has never been developed to any degree.

3. Intelligence. Some data are in evidence, especially those collected by the Surgeon General's office during the late war.

4. Interests. See Table 50.

5. Education. Amount of schooling required for entrance.

6. Income. Sometimes referred to as socio-economic status.

7. Prestige value. Classification on basis of how people generally regard the occupations. Possibly might be called the sociologist's classification.[12]

8. Potential challenge. Classification not on basis of merits of occupation itself but on the possibilities it holds for advancement to better positions in terms of (*a*) income, (*b*) opportunity to wield power and secure prestige, and (*c*) opportunity for expression of an individual's interests and for use of his abilities.[13]

The first five systems and to a considerable degree the last system are psychological in nature. They all have reference to the habits performed in the jobs and the abilities and interests required so that one may acquire the necessary habits in a reasonable amount of time. In contrast to these systems is the classification used by the census, which is based too much on the organization of industry and too little on the functions performed. The seventh system is also primarily of psychological concern, but here the emphasis is upon what people in general think about occupations rather than upon what is actually done. The sixth system alone deals with the characteristics of the occupation as such, and here merely with what income is obtained by men working therein. Such classifications, except the sixth, are all concerned with the characteristics of the people who work in the occupations. At first thought this rather mystifies one; but after considering the matter

[12] The scales used so extensively by research people in the fields of education, psychology, and sociology by which occupations are assigned to intelligence levels have necessarily been based on opinions of experts. How far the Barr, Taussig, Beckman, Minnesota, and other occupational-rating scales depict true intelligence levels and how much they record prestige levels is really unknown.

[13] D. E. Super, "Occupational Level and Job Satisfaction," *Journal of Applied Psychology* (1939), **23**, 547-64.

it is apparent that there isn't any job until a man works there and the really vital aspects of the job are always the characteristics of the worker.

Such good progress is being made by many business concerns and by the research department of the United States Employment Service in classifying jobs that a really fine classification in terms of duties performed should be available before long. The pity of it is that, lacking a good psychological classification of duties, personnel managers are forced to use common-sense terminology. As long as jobs are expressed by one set of terms and men by another set of terms it will be difficult to translate findings from one system into the other.

The remainder of this section is concerned with the relationships between occupational hierarchies based on intelligence, interest, and income. Many questions naturally come to mind in this connection for which we lack a comprehensive answer. For example, do the men who earn large incomes differ in terms of intelligence and interest from those who earn small incomes? Is large income primarily a matter of supply and demand, of getting into an occupation which is protected and of keeping other people out of it? If all men had equal knowledge and equal opportunity, would all occupations yield about the same income? Or are the differences among men so great that the relatively few men of superior ability able to render superior services of one sort or another will always be able to command superior income?

Psychologists have long maintained that intelligence is a factor which affects income to a considerable degree. Apparently each occupation calls for men of a given range of intelligence. Men with too high intelligence lose interest and drop out; men with two low intelligence are unable to learn the work in a reasonable amount of time. Does the same thing hold true with respect to interest? Are there men with interests which peculiarly fit them to well-paid occupations and other men with interests, or possibly lack of interests, which debar them from succeeding except in the poorly paid jobs?

If the answer is yes it may explain supply and and demand. If there are relatively few men with high intelligence and the right kinds of interests, the high price paid for their services and the

low income earned by the many who lack these characteristics are explained.

The questions raised here are important ones. Answers to them will affect social theories and political action relative to the distribution of income. Leveling of incomes is quite consistent with the theory that income is purely a matter of supply and demand. Differentiation of income on a hierarchal basis is compatible with the doctrine of individual differences.

Unfortunately the data are lacking to determine the issue. For certain occupations we have the average intelligence score. This is likewise true respecting interest scores. Similarly, the income for occupations within certain industries, or within certain areas, are known. Unfortunately, data are available for relatively few occupations common to any two of these three factors, so that correlations between any two factors must be restricted to a few variables.

The writer has accumulated what data he could find and presents the results here. Most of the data must be considered quite unreliable and the resulting coefficients of correlation have unknown biases in the sampling. Only the general drift of all the data may be accepted as significant, and that only temporarily until better and more extensive data are available. The situation ought to challenge someone to investigate the subject.

Occupational hierarchy in terms of intelligence.—Considerable data were accumulated by the Surgeon General's Office[14] regarding the intelligence of men classified by occupations, using the Army Alpha test for this purpose. These data reflected the caliber of the men in the draft for the first World War. It is believed that these were not a true sampling of men of that age in the country as a whole. Fryer[15] has modified the original data somewhat in the light of these limitations and has presented averages and interquartile ranges of scores for 96 occupations. Unfortunately only a few of his occupations can be compared with the occupations scored on the Occupational Level scale. Sufficient of his data are given in Table 58 to give a fair idea of the rank order of occupa-

[14] "Psychological Examining in the United States Army," *Memoirs of National Academy of Sciences* (1921), **15**, 819–37.

[15] D. Fryer, "Occupational-intelligence Standards," *School and Society* (1922), **16**, 273–77.

TABLE 58

DIFFERENTIATION OF OCCUPATIONS BY ARMY ALPHA TEST AND OL SCALE

Occupation	Army Alpha Intelligence Score[a]					Occupational Level Score			
	Mean Score	σ	Percentage Overlapping with			Mean Raw Score[b]	Percentage Overlapping with		
			Laborer	Printer	Carpenter		Unskilled	Printer	Carpenter
Lawyer	...	....	....	....	....	124	20.4	36	28.5
Advertising man	...	....	....	....	....	124	24.1	40	32.5
C.P.A.	...	....	....	....	....	117	23.0	40	32
Life insurance salesman	...	....	....	....	....	109	27.4	46	37
Engineer	161	54.1	8	29.5	25	102	27.6	47.5	38
Clergyman	152	45.2	6	30	24	83	33.5	58	46
Accountant	137	38.5	7	34	28	88	35.7	58	48
Physician	127	42.3	12	43	37	101	29.9	50	40.5
Chemist	119	33.4	9	44	37	92	32.5	54.5	44
Y.M.C.A. secretary	111	47.4	21.5	58	53	87	35.3	62	47.5
Dentist	110	35.6	....	52	46.5	75	41.5	67	55
Office man	96	35.4	58.1	64	60	70	44.2	70	58
Musician	82	37.8	....	79	75.5	46	56.3	87	73
Policeman	69	32.6	....	90	89	18	73.6	92	92
Carpenter	60	32.6	50	....	....	7	81.3	84	....
Printer	60	42.3	....	....	....	29	66.1	....	84
Laborer (construction)	21	25.2	....	....	....	...	....	....	....

[a] Means from W. V. Bingham, *Aptitudes and Aptitude Testing* (Harper & Bros., 1937), pp. 46–47. Sigmas calculated from Q_1 and Q_3. Bingham's table is taken from Fryer's revision of data presented by the Surgeon General's Department

[b] Standard deviations given in Table 50

tions in terms of intelligence. Another such hierarchy has been published by Pond[16] relative to occupations within a manufacturing plant. Unfortunately here also few of her occupations are comparable to those published in other hierarchies. The same is true of several other studies, none of which could be used by us for that reason.

Such data indicate that there is very wide variation in intelligence-test scores by men in every occupation, so that, knowing a man's score, it is impossible to say to which occupation he belongs. Data like these exaggerate the differences, because emphasis is given to mean scores of occupations or to inter-quartile (middle 50 per cent) range of intelligence-test scores.[17] Actually a few members of occupations averaging low in intelligence could belong to almost any occupation with high average and vice versa. In the table published by Fryer, locomotive engineer has an average score of 74. This score is included within the inter-quartile range of office clerk (average of 96) and of station agent (average of 48). The average locomotive engineer has accordingly a score falling within the inter-quartile range of 67 of the 96 occupations listed. If the entire range of scores were given, it is probable that the average locomotive engineer would be included within the range of intelligence-test scores for all occupations. It is only very roughly that we may say that an occupation has an intelligence level of so much. This may be true for the average in the occupation, but there are many individual members deviating widely from the average.[18]

[16] M. Pond, "Occupations, Intelligence, Age, and Schooling," *Personnel Journal* (1933), **11**, 373–82. The data of Fryer and Pond are reproduced in W. V. Bingham, *Aptitudes and Aptitude Testing* (Harper & Bros., 1937), pp. 46–52. See also the more recent article of I. Lorge and R. D. Blau, "Broad Occupational Grouping by Intelligence Levels," *Occupations* (1942), **20**, 419–23.

[17] See for example, the often published figure 57 of *Memoirs of National Academy of Sciences* (1921), **15**, 829. The bars showing inter-quartile range give the impression of fairly distinct separation of occupations at the top and bottom of the figure. Part of the excessive range of intelligence-test scores was probably caused by faulty classification of men into occupations. The writer personally knows that the Surgeon General's instructions were not carefully followed in some camps, where men were assigned to the occupation they merely claimed without any effort being made to check the statement. In such camps part-time bookkeepers became accountants, etc.

[18] This very great overlapping between occupations respecting intelligence test and OL scores is also true respecting income. Davidson and Anderson, for example, report: "It appears that the upper limits of the middle fifty per cent of unskilled laborer's earnings reach those of some workers located in the middle fifty per cent

In addition to these data obtained from men already engaged in occupations, certain data have been obtained from students whose occupational status has been ascertained later on. Such studies bear more directly on the problem of estimating a man's future occupation from his intelligence score while a student. Proctor[19] tested high-school boys on the Army Alpha test in 1917–18 and assigned these students thirteen years later to five occupational levels. Level I averaged 114 IQ; level II, 108; level III, 105; level IV, 99; and level V, 97. He concluded: "When all cases are considered the trend seems quite marked, but in individual cases it is neither possible nor safe to make specific predictions" of occupations engaged in on basis of intelligence score. Another example showing similar trend between intelligence and occupational level is that of Clark and Gist.[20] Several thousand rural high-school students in Kansas were given an intelligence test in 1922–23. Thirteen years later the specific occupations of 2,423 of these, now men and women, were ascertained. The mean IQ and sigma of their occupational classifications follow:

Occupational Group	Mean IQ	σ
Professional	102.9	11.8
Clerical	100.0	11.6
Teachers	99.3	10.7
Salespeople and proprietors	96.6	11.8
Skilled workers	96.2	10.5
Housewives	95.4	11.0
Semiskilled and unskilled	93.3	11.4
Farmers	92.8	11.2
Housekeepers and unemployed	91.4	9.4

Most of the differences between means are statistically significant, but at the same time differences of 5 IQ cannot be considered as

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of clerical worker's incomes; the middle fifty per cent of earnings of the semi-skilled reach into the middle fifty per cent of proprietors, as do the earnings of skilled and clerical workers." P. E. Davidson and H. D. Anderson, "Are Edward's Socio-economic Levels Economic?" *School and Society* (1938), **48**, 153–56.

[19] W. M. Proctor, "A 13-Year Follow-up of High-School Pupils," *Occupations* (1937), **15**, 306–10.

[20] C. D. Clark and N. P. Gist, "Intelligence as a Factor in Occupational Choice," *American Sociological Review* (1938), **3**, 683–94.

large.[21] Despite the indicated trend, the size of the standard deviations emphasizes wide variation in intelligence within each group. Ironically, "the highest score in the entire sample was made by one classed as an unskilled laborer."

Ball[22] determined in 1937 the occupational status on the Barr scale of 219 men whose scores on the *Pressey Mental Survey Test* had been obtained in 1918 or in 1923. The correlation for the 14-year interval was .57 and for the 19-year interval was .71. These results are in agreement with the earlier work of Proctor[23] but not with those of Thorndike.[24] The latter's negative conclusions have been attacked on the ground that the follow-up interval was too short, thus preventing the young people from reaching anything like their ultimate occupational level, and the tests were too simple to determine intellectual dispositions toward complex jobs. Ball concludes:

> These coefficients indicate a substantial conditioning of occupational level by intelligence, such that, even granting the important role of other factors (i.e., special tuition, traits of character and personality, chance opportunities, and favoritisms), practical use may be made of intelligence scores in vocational guidance work. This holds, of course, only for grosser distinctions in level of occupation, since it is patent enough that adjustment to finer distinctions of occupations is most significantly determined by other than intellectual factors.
>
> That the correlation increases as the time between measurements increases, is interpreted to mean that an increasing adjustment of the two variables is taking place. This would account for the fact that cross-sectional studies on young persons and short-interval longitudinal studies generally yield low correlations, whereas cross-sectional studies of mature persons and long-interval longitudinal studies yield higher correlations.

Occupational hierarchy in terms of income.—Occupations may also, theoretically, be arranged in rank-order in terms of income

[21] Much larger differences have appeared in a number of studies where IQ of children was compared with father's occupation, but that is matter other than the one considered here.

[22] R. S. Ball, "The Predictability of Occupational Level from Intelligence," *Journal of Consulting Psychology* (1938), **2**, 184–86.

[23] W. M. Proctor, "Intelligence and Length of Schooling in Relation to Occupational Levels," *School and Society* (1935), **42**, 783–86.

[24] E. L. Thorndike *et al.*, *Prediction of Vocational Success* (J. J. Little and Ives Co., New York, 1934).

received. Actually the data have not been published by which such a hierarchal distribution can be established for occupations generally. Here and there are certain groups of occupations in which a classification can be made with respect to income. An example would be with respect to the salaries paid teachers, principals, supervisors, and so on in a school system. Another example is the wages paid employees in the Class I Steam Railways reported by the Inter-State Commerce Commission. In many cases, no data are available or, if there are some, they are of problematic significance. Even when there are well-established figures in each of several groups of occupations it is difficult to combine them into a hierarchy, because job names vary and seemingly comparable jobs differ considerably. There are a host of other well-recognized factors which complicate the problem.

Correlations between the hierarchies based on interest, intelligence, and income.—Fifteen comparisons have been made by us of the average intelligence of the members of occupations and their average income. The variables range from 5 to 74 with a median of 10; the coefficients of correlation range from .14 to .98 with a median of .53. Aside from the fact that such variations in correlations are the resultant of an unknown amount of error, there is the factor of inclusion or not of certain occupations. Clergymen, for example, have high intelligence but low income. If this occupation is included in a table the correlation is lowered thereby. Inspection of the data leads one to believe that much of the variation in these correlations is to be explained on this basis.[25]

Five comparisons have been made of occupational level scores and income. The variables range from 9 to 24, with a median of 11; the coefficients range from .12 to .77, with a median of .61. The difference between this .61 and the .53 reported above is of course too slight to be considered significant when the quality and quantity of data are considered.

Four comparisons between intelligence of occupations and OL scores are based on variables of 6, 8, 14, and 27, giving correlations of .99, .99, .88, and .82.

These correlations are between averages for occupations. They

[25] The details of all these calculations are not given, for they are frankly not worth publishing. They are, however, the best we could discover.

should be supplemented by correlations between intelligence, interest, and income for individuals.

Psychologists have accepted the hypothesis that amount of intelligence is a determiner of success in occupations. Much more data than are now available are needed to establish this hypothesis and give a basis for understanding the ifs, ands, and buts that must necessarily qualify the general statement. According to these data, interests are equally significant for determining occupational success. This view has long been held by people in general, but we have not had data supporting it. Even now the data available must be supplemented greatly before we may be sure of the exact situation.

Both intelligence and interest correlate about .58 with income. As this means a forecasting efficiency of only about 17 per cent, there are other factors which determine income. The economist's law of supply and demand cannot be thought of as another factor necessarily, as the supply and demand may have reference to intelligence and interest.

Amount of differentiation in terms of intelligence and OL scores. —How do the Army Alpha intelligence test and the OL scale compare in this respect? Which of these two devices differentiates occupations the better?

Table 50 gives the differentiation of occupations by the OL scale. Table 58 presents corresponding data with the Army Alpha test. The standard mean scores in the former range from 64 to 44 and in the latter from 70 to 37, as given by Bingham. The intelligence test gives, consequently, a 65 per cent greater range of scores than the OL test. There is an 8 per cent overlapping between engineer, which scores highest on the intelligence test, and construction laborer, which scores lowest. The corresponding overlapping on the OL scale is 27.6 per cent. There is considerable doubt, however, as to whether or not construction laborer is equivalent to unskilled as the latter is used in the OL calculations. Comparisons with printer and carpenter afford a more accurate basis for our calculations. Here engineer overlaps with printer and carpenter 27 per cent on the Army Alpha test and 43.0 per cent on the OL scale.

In all these comparisons engineer is used, which scores highest, as far as we know, on the intelligence test but considerably

lower than lawyer on the OL scale. A fairer comparison would seem to be to contrast the highest and lowest occupations on each test. The overlapping of engineer and construction laborer is only 8 per cent on the intelligence test and between lawyer and unskilled it is 20.4. Or if carpenter and printer are used instead of laborer, as above, the overlapping on the Army Alpha test is 27 and on the OL scale 32 per cent.

The present evidence is accordingly that the intelligence test differentiates occupations to a greater degree than the occupational-level scale. (This statement has reference to the occupational-level scale and not to the specific occupational or group scales.) Further investigation may show that the intelligence test differentiates considerably better than the occupational-level scale or that the difference between the two in this respect is not great.[26]

It has been a puzzle to many who have considered the very wide range of intelligence-test scores within a given occupation how the men with the lowest scores could possibly carry on their work successfully and also why the men with the highest scores would continue in what must be a very humdrum occupation for them. If it could be established that the men with low intelligence scores are the men with high occupational-level scores, and vice versa, then we would have a satisfactory explanation of this phenomenon. Again, if such was the case, combined scores of intelligence and occupational level might give much better differentiation of occupations. There are some real possibilities here, since the correlation between OL and Thorndike intelligence is only .05.[27] Such a correlation warrants the expectation not that high intelligence scores and low OL scores are to be associated generally but that some of the more striking cases, referred to above, might possess such combinations, or the reverse.

All this suggests that an exceedingly useful classification of occupations may be obtained by utilizing both intelligence and interest. These two factors are apparently independent of each other

[26] This argument has been based on the assumption that the two sets of standard scores are comparable. They may, however, differ sufficiently to nullify the conclusion.

[27] See Table 193, facing p. 716. Correlation between scores of individuals must not be confused with the high coefficients, given on p. 212, in which mean scores of groups are correlated.

but both correlate significantly with income and what is freely called socio-economic status. Men with appropriate intelligence and OL interest would be doubly well classified as to occupation. How to advise men with appropriate intelligence but not of corresponding OL, and vice versa, remains to be worked out. In the light of the wide range of intelligence scores found in every occupation it is not wise to conclude that a man with intelligence below the average of an occupation cannot succeed there. The chances may be against him, but if other factors are favorable he may succeed.

Chapter 11. Interests of Men and Women—the MF Scale[1]

Before the advent of intelligence tests it was customary to view women as having intelligence inferior to that of men. Widespread use of these tests has demonstrated the fallacy of that view. But the fact that the two sexes obtain approximately equal scores in the tests does not mean that the character or quality of their intellectual processes is similar. They may have the same general capacity and at the same time use this capacity in different directions.

Ministers and engineers want to reach different goals and are interested in quite different procedures. Similarly men and women desire to accomplish different things in life and possess somewhat different interests. The differences in their interests throw some light on their somewhat different aims in life.

Despite much research and discussion we do not know the causes of differences in interests between men and women. Possibly, as some claim, it is because boys and girls are brought up differently. Possibly it is because they possess somewhat different abilities—women apparently are superior to men in linguistic abilities, and men surpass women in mathematics and mechanical activities. Possibly, it is because they possess different fundamental drives because of differences in hormones.

Several problems may be mentioned upon which our data throw some light. First, do men who have significantly the interests of women and women who have significantly the interests of men behave characteristically differently from the average of their own sex? Second, do men and women engaged in the same work have the same interests? To answer the latter question it would be necessary to test members of both sexes performing exactly the

[1] This chapter is a thorough revision of the article, "Interests of Men and Women," *Journal of Social Psychology* (1936), 7, 49–67.

same activities. This has not been done by us. Our men and women office workers, for example, represent the men and women who are found in such jobs, but we have no proof that they perform the same work. Consequently, such differences in interests as are found between the two groups may be a reflection of different work done or of different interests inherent in men and women regardless of the work they are doing.

The chapter deals specifically, first, with the development of a scale to measure the interests of males and females (MF, masculinity-femininity); and, second, with the significance of the results obtained by the scale.

THE MF SCALES

An MF scale for measuring the interests of males and females is constructed by weighting the items proportionately according as men prefer them more than women. The procedure has already been discussed in chapter 5 and is the same as that used in developing the OL scale (see chapter 10, above).

Six different scales for the men's blank and one scale for the women's blank have been used. The sixth scale for men is employed at this time.

The data for all these seven scales are drawn from three age levels, namely, high-school students, college students, and adults, upon the supposition made at the beginning of this study that differences in interests between the two sexes would vary somewhat with age.

1. *High-school group.*—Carter[2] developed a masculinity-femininity scale based upon the Strong *Vocational Interest Blank* of 38 pairs of unlike-sexed twins and 76 additional pairs of boys and girls. All these were drawn from grades 7 to 12 inclusive, the 114 males averaging 16.6 years of age (S.D. 1.83) and the 114 females averaging 16.4 years of age (S.D. 1.86). Reliability of this scale is .86 for males only, .78 for females only, and .94 for both sexes combined.

[2] H. D. Carter, "Twin Similarities in Occupational Interests," *Journal of Educational Psychology* (1932), **23**, 641–55. H. D. Carter and E. K. Strong, Jr., "Sex Differences in Occupational Interests of High-School Students," *Personnel Journal* (1933), **12**, 166–75.

2. *College group.*—A similar scale has been prepared by us from the records of college students. Each male in this group was paired with a female of the same age, year in college, Thorndike Aptitude[8] score (within eight points in all cases and within five points in nearly all cases), and average grade-point ratio (within .25 point in all cases). The 154 pairs are slightly superior to the average Stanford University student, since their average Thorndike score is 84 and the median of all Stanford students at that time was 79, and their average scholarship ratio is 2.7 in comparison with 2.5 for all undergraduates (where C = 2 and B = 3). The average age is 19.3 years and the average school grade is 14.5 (halfway through junior year) for both sexes.

3. *Adult group.*—As there is no convenient way by which true samplings of adult males and females can be obtained, we have contented ourselves here with contrasting the interests of husbands and wives. How such samples differ from true samples is unknown. Certain of these couples were those used by Professor Terman in a study of the factors affecting compatibility of married couples and included both divorced couples and those presumably happily married. The remainder were very largely women members of the California Congress of Parents and Teachers and their husbands. As the 277 wives averaged four years less than their husbands in age, 58 additional pairs of unmarried men and women were added so as to bring the average in both sexes to 38.4 years of age for the 335 pairs of men and women.

Six MF scales for the men's blank.—Six MF (masculinity-femininity) scales have been developed from these three sets of data. They are referred to, respectively, as (1) the High School MF scale, (2) the College MF scale, (3) the Adult MF scale, (4) the MF scale (±15 weights), (5) the MF scale (±3 weights), and (6) the MF scale (±4 weights). The fourth, fifth, and sixth scales are based upon all the data included in the first three, i.e., upon 603 males and 603 females. They are actually an average of the first three, for the percentages obtained in the case of the first three were averaged and the last three scales were based thereon. Accordingly the last three represent an average age of

[8] *Thorndike Intelligence Examination for High School Graduates.*

24.7 years; however, since the first three scales give nearly identical results, the fourth, fifth, and sixth scales represent at least the age range of 16 to 38 years of age very well. The fifth scale differs from the fourth only with respect to the weighting of the items; in the fourth scale the weights range from 15 to —15 whereas in the fifth[4] they range from 3 to —3. Later the sixth scale was developed with weights ranging between 4 and —4 in order to conform to the revised men's scales, all of which have this range of weights. The correlation between the fifth and sixth scales is .970 based on the blanks of 100 adult women and .979 on the blanks of 100 adult men.

Scores reported here on the High School MF scale are based on 100 boys and 100 girls not included among those from whose blanks the scale was developed. These boys and girls averaged 16.3 years of age and 11.3 school grade. Scores reported on the College MF scale are based on the 150 college men and 150 college women from whose blanks the scale was developed. They averaged 19.3 years of age and 14.5 college grade. Scores reported on the Adult MF scale are based on records of 100 pairs of married couples from among 355 pairs upon whom the scale was based, the men averaging 40.2 years of age and the women 36.0 years of age, the men averaging 1.2 years in college (13.2 school grade) and the women .3 less (12.9 grade).

The close relationship which exists among the six MF scales is set forth in Table 59. Among the first three scales the High School and the Adult correlate the highest (average of two coefficients is .90), the High School and the College correlate next highest (.81), and the College and the Adult the lowest (.74). Evidently these three groups differ in other respects than merely age, or the High School and the Adult scales would not correlate higher than either of these with the College scale. All three scales correlate over .90 with the Average scale (±15), but even here the High

[4] Weights of 15 to 11 have a weight of 3 on the fifth scale; 10 to 7, a weight of 2; 6 to 3, 1; 2 to —2, 0; —3 to —6, —1; —7 to —10, —2; and —11 to —15, —3.

Correlations between the MF scale (±15 weights) and the MF scale (±3 weights) based on 100 adult women is .977 (P.E. .003), upon 100 adult men it is .987 (P.E. .002), and upon the two groups combined it is .993.

Reliability of the MF scale ±3 is .92 by odd-even technique, based on records of 150 college men.

School scale correlates highest of the three (.96), the Adult scale is next (.923), and the College scale third (.917). Yet all three have supposedly contributed equally to the Average scale.

TABLE 59

CORRELATIONS BETWEEN SCORES ON THE SIX MF SCALES*

MF Scales	High School	College	Adult	Average ± 15	Average ± 3	Average ± 4
High school	....	.784	.911	.953	....	....
College	.842	....	.679	.907	....	....
Adult	.895	.797	....	.906	....	....
Average ±15	.957	.926	.940	....	.977	.970
Average ±3	....	....	....	.979	....	....

* Lower left-hand coefficients based on 100 high-school girls; upper right-hand coefficients based on 100 adult women

Norms of the sixth MF scale (±4) for men.—As previously stated this scale supersedes the fifth scale (MF ±3) so that the weighting system may correspond with that of the revised men's scales.

Raw scores, standard scores, and percentiles for high-school boys and girls, college men and women, and adult men and women are given in Table 60. Reliability of the scale is .96, based on the blanks of 100 adult men and 100 adult women. Permanence for five years is .865 and for ten years it is .841, based on test-retest of college seniors. These coefficients are the highest of all scales (see Table 95, p. 360). Changes in test-retest scores of high-school and college students are small; the greatest difference in mean scores is 2.7 standard score, which, although small, is statistically significant (see Tables 195 and 196, pages 720 and 722).

Standard scores are based on the data from the 372 cases comprising the three subgroups of males. High-school boys score slightly more masculine than the average and adult men slightly more feminine. As the critical ratios of these differences are only 2.6 and 2.0, respectively, the differences cannot be stressed.

The MF scale for the women's blank.—The MF scale for the women's blank is based on data secured for the MF scales for the men's blank in which the items are weighted ±3. It utilizes

TABLE 60

NORMS FOR REVISED MF SCALE FOR MEN'S BLANK

Percentile Scores of Males and Females on the Masculinity-Femininity Scale (±4)

MF Score		Males				Occupational Criterion Groups (N=3999)	Females			
Raw	Standard[a]	High School (N=129)	College (N=143)	Adults (N=100)	Total (N=372)		High School (N=129)	College (N=143)	Adults (N=100)	Total (N=372)
220..	71	..	..	99	99	99	..	..	..	..
210..	69	..	99	99	99	99	..	..	..	..
200..	68	99	99	99	99	99	..	..	..	..
190..	67	98	97	99	98	99	..	..	..	..
180..	65	96	94	99	96	99	..	..	..	..
170..	64	94	92	99	94	98	..	..	..	..
160..	63	91	90	97	92	97	..	..	..	..
150..	61	86	87	95	89	95	..	..	..	..
140..	60	84	83	92	86	93	..	..	..	..
130..	59	78	78	92	82	91	..	..	..	..
120..	57	71	74	84	76	88	..	..	..	..
110..	56	67	70	80	72	84	..	..	..	..
100..	55	56	65	76	65	80	..	..	..	..
90..	53	48	58	68	57	76	..	..	..	..
80..	52	45	54	59	52	72	..	..	..	..
70..	51	37	50	54	47	66	1	..	1	1
60..	49	31	45	51	42	60	1	1	1	1
50..	48	29	42	47	39	55	2	1	1	1
40..	47	26	38	44	36	50	2	1	1	1
30 .	45	20	33	37	30	44	3	2	1	2
20..	44	17	30	30	26	39	3	3	1	2
10..	43	13	26	27	22	33	6	3	1	3
0..	41	11	22	24	19	28	9	3	1	5
-10..	40	9	17	20	15	24	9	4	2	5
-20..	39	7	13	18	12	20	11	6	5	7
-30..	37	5	13	13	10	17	15	7	6	9
-40..	36	2	11	13	9	13	22	9	12	14
-50..	35	2	10	12	8	11	22	10	14	15
-60..	33	2	10	11	8	9	26	13	17	19
-70.	32	2	9	11	7	7	29	17	20	22
-80..	31	2	7	6	5	5	35	20	26	27
-90..	30	1	6	6	4	4	40	25	31	32
-100..	28	1	4	6	3	3	49	33	35	39
-110..	27	..	3	4	2	2	57	38	41	45
-120..	26	..	2	3	2	2	66	43	45	51
-130..	24	..	1	3	1	1	71	50	55	58
-140..	23	..	1	3	1	1	81	60	61	68
-150..	22	..	1	3	1	1	84	68	69	74
-160..	20	..	1	2	1	1	86	73	74	78
-170..	19	..	1	1	1	..	90	82	79	84

[a] Standard scores based on distribution of 372 males; mean age of 372 is 23.5 years.

TABLE 60 (*Concluded*)

MF Score		Males				Occupational Criterion Groups (N=3999)	Females			
Raw	Standard[a]	High School (N=129)	College (N=143)	Adults (N=100)	Total (N=372)		High School (N=129)	College (N=143)	Adults (N=100)	Total (N=372)
-180..	18	..	1	1	1	..	91	87	80	87
-190..	16	..	..	..	..	..	96	92	89	92
-200..	15	..	..	..	..	..	98	94	93	95
-210..	14	..	..	..	..	..	99	95	95	97
-220..	12	..	..	..	..	..	99	95	96	97
-230..	11	..	..	..	..	..	..	98	97	98
-240..	10	..	..	..	..	..	..	99	98	99
-250..	8	..	..	..	..	..	..	..	98	99
-260..	7	..	..	..	..	..	..	..	99	99
Raw Scores										
Mean.....		82.1	60 6	46.8	64.4	38.8	-85.7	-111.8	-110.2	-102.3
Sigma.....		61.56	81.72	77.14	75.33	70.28	59.30	57.30	59.22	59.78
Standard Scores										
Mean.....		52.3	49.5	47.7	50.0	46 6	30.1	26.6	26.8	27.9
Sigma.....		8.2	10.8	10.2	10.0	9.3	7.9	7.6	7.9	7.9

263 items that are common to the original men's blank of 420 items and the unrevised women's blank of 410 items.[5] The correlation between the fifth MF scale for men (weights of ±3) and the MF for the women's blank is .87, based on the records of 150 college men. The correlation would, of course, be higher if records of both males and females were considered.

Norms for the MF scale for women.—Norms for the ±3 MF scale for the women's blank correspond to the norms for the men's scale in Table 60 except that here the standard scores are expressed in terms of women's interests, not men's interests. Reliability of the scale is .78.

Interests of the two sexes as measured by the scale are distinct. The critical ratio of the differences in means of high-school boys and girls is 18.7, for college men and women it is 15.9, and for adult men and women it is 17.3.

[5] It is hoped that before long an MF scale for the women's blank can be based upon all of the 400 items appearing on that blank. This is one of the many parts of this research that we have not yet been able to complete.

THE TERMAN-MILES MF TEST[6]

The Terman-Miles MF scale consists of 456 items (Form A), each one of which was selected from a much larger number because it differentiated between the two sexes. There are seven parts to the test, each having "little in common"—the average correlation between two parts is only .11 (range between —.15 and .47)[7] and the average correlation between one part and the other six parts is only .39. The authors conclude that "MF differences are so largely specific for the various types of items composing the separate exercises [parts] that search for a general factor or group factors by the application of factor-analysis techniques would be futile."[8] Part 5, "Interests," and the first half of Part 6, "Personalities," contain 146 items quite similar to our test. Part 5 differentiates the two sexes better than any other part, in fact, nearly as well as the whole test, and correlates higher with the other parts than does any other part. Its reliability is, however, somewhat less than that of Part 4, which is concerned with reactions to anger, fear, disgust, pity, and ethical situations.

The Terman-Miles MF test correlates ".43 for a group of 41 males and .62 for a group of 62 females" with the Carter High School MF test,[9] which in turn correlates .953 with our ±15 MF test. Terman and Miles conclude that "the two tests are not measuring the same thing to the extent of more than 10 or 20 per cent."[10] It is doubtful if these data are sufficient to determine the exact relationship between the two tests, but it is apparent that the relationship is not close. Nevertheless the results so far reported agree surprisingly well, although there are certain differences, pointed out below.

Those physical characteristics which are ordinarily associated with the two sexes are not related to the Terman-Miles MF test,[11] but athletic prowess in both sexes is associated with masculinity—women athletes with high intelligence and low scholarship score more masculine than male artists and men over 60 years of age.[12]

[6] *Attitude-Interest Analysis Test*, see L. M. Terman and C. C. Miles, *Sex and Personality* (McGraw-Hill Book Company, 1936).

[7] *Ibid.*, p. 57. [8] *Ibid.*, p. 58. [9] *Ibid.*, p. 42.

[10] *Ibid.*, pp. 42–43. [11] *Ibid.*, p. 86. [12] *Ibid.*, pp. 115–16.

Both sexes increase in masculinity from the 8th grade to 11th grade for men and to second year of college for women and then steadily decrease until 80 years of age.[13] "Intelligence is probably positively correlated with mental MF score for both sexes at certain ages. The relationship appears to be more pronounced for the youngest boys than for the youngest girls, but thereafter more pronounced for the females than for the male populations."[14] Amount of education is similarly associated with higher (more masculine) scores for both sexes in the younger years and throughout life. "For the men, college and high-school education seems to exert a more masculinizing influence than grade-school education. For the women, college training apparently has a significantly more masculinizing influence than high-school or grade-school education. We do not know whether or to what extent selection may be responsible for these effects."[15] No relationship is apparent between MF scores and ratings by teachers on a number of personality traits, possibly because of the low reliability of those ratings.[16] On the other hand, there is very pronounced relationship between masculinity and mechanical pursuits at every educational level.[17] Equally evident is the fact that occupational groups differ with respect to MF scores, as pointed out below. Passive male homosexuals are "the most feminine testing group of males, ... more feminine in fact than our group of outstanding college women athletes."[18] Active male homosexuals, on the other hand, score about average for men. The characteristics of masculinity and femininity as indicated by this test are given below, page 240.

Data are not at hand as to whether or not scores on our MF scales would give similar results on most of the traits indicated, except for age and occupation, which are discussed below.

There are certain differences between the Terman-Miles test and our own that should be called to mind. Every item in their test was selected because it did differentiate the two sexes. The actual degree of likeness and difference between the sexes cannot there-

[13] See page 230, below, for further discussion.

[14] Terman and Miles, *op. cit.*, p. 156. Our MF scale correlates .13 with intelligence (Thorndike) based on 285 college seniors.

[15] *Ibid.*, pp. 144–45, 156. [16] *Ibid.*, p. 95. [17] *Ibid.*, p. 105.

[18] *Ibid.*, p. 257.

fore be ascertained by the test except that it can be assumed that the sexes are not likely to differ by more than is indicated by the present Terman-Miles test results. Our own test, on the other hand, is based upon items previously chosen for a different purpose. The differences found thereby would seem to be a fairer measure of the amount of difference that exists between the interests of the two sexes. Moreover, similarities in interests can be ascertained with our test, as set forth in chapter 6, in a way that cannot be done with the Terman-Miles test, since items, which did not differentiate, were excluded. Despite these differences in test construction, the Terman-Miles test does not differentiate the two sexes very much more than our test: Males score 25.8 standard scores higher than females on their test and 22.0 standard scores on our test.

Some of the puzzling contradictions in results, or possibly we might say, some of the results which are difficult to understand, in the Terman-Miles study may be caused by varied results in the subtests. They publish (p. 570) the following scores:

Part	1	3	4	5	6	Total
308 high-school boys	.30	.50	−.10	.95	.25	.75
44 engineers	.15	.30	.70	.35	.45	.75
Critical ratio	<1	1.8	6.3	3.6	1.3	<1

These two groups average the same standard score of 75, but the engineers are far more masculine in Part 4—emotional and ethical responses—and far less masculine in Part 5—interests. The writer is frankly curious as to how far varying scores on the parts of the test may have contributed to the effects associated with intelligence, education, and scholarship.[19]

INTERESTS OF MEN AND WOMEN MORE SIMILAR THAN DISSIMILAR

It has always been customary when discussing men and women to emphasize differences between them. We are now familiar with the fact that the two sexes are quite similar in most mental respects.

[19] In studying the personality traits of high- and low-scholarship men of equal scores on the *Thorndike Intelligence Examination for High-School Graduates*, Tinsley found differences with only one test, namely, Terman-Miles, *Attitude-Interest Analysis Test*, Part 5. The high-scholarship group proved to be less masculine, correlation of $-.352 \pm .053$. Part 5 is similar to our MF test, but it is not sufficiently similar so that one can conclude that similar results would be found with our test. R. E. Tinsley, "Personality Traits of High and Low Scholarship Men of Equal Thorndike Intelligence," unpublished Master's thesis, Stanford University, 1931.

The same holds true with respect to their interests—on the whole they are more similar than dissimilar, as has already been pointed out in chapter 6. The interests of the two sexes may, however, be made to appear quite dissimilar when their interest blanks are scored on the MF scale, which was designed for the express purpose of measuring whatever differences there are.

The same relationships hold for attitudes as well as interests. For example, Skaggs[20] investigated the moral attitudes of college students of both sexes. "In general," he says, "it is remarkable how similar are the moral views of the two groups. One single outstanding exception to this statement is the judgment of the two sexes on 'Intimate Sex Relations Outside of Marriage.' . . . . One may find some sex differences in roughly about 20 per cent of comparisons and no sex differences in some 80 per cent of comparisons."

Newcomb and Svehla[21] report correlations of .76, .43, and .58 for husbands and wives on three Thurstone attitude scales of church, war, and communism. Stagner[22] reports correlations of .57 for reactions to a set of stereotypes and .61 for responses to ten opinions. Terman[23] lists the rank-order for husbands and for wives of the grievances they have respecting their spouses; the two lists correlate .76.

Possibly when it is more fully realized that the interests and attitudes of the two sexes are far more similar than dissimilar, writers will not strain so hard to find explanations why husbands and wives agree as much as they do.

DIFFERENTIATION OF THE TWO SEXES WITH THE MF SCALE

Despite the fact that similarities of interests outweigh the differences, it is nevertheless possible to differentiate the two sexes very

[20] E. B. Skaggs, "Sex Differences in Moral Attitudes," *Journal of Social Psychology* (1940), **11**, 3–10.

[21] T. Newcomb and G. Svehla, "Intra-family Relationship in Attitude," *Sociometry* (1937), **1**, 180–205.

[22] R. Stagner, "Marital Similarity in Socio-economic Attitudes," *Journal of Applied Psychology* (1938), **22**, 340–46.

[23] L. M. Terman, *Psychological Factors in Marital Happiness* (McGraw-Hill Book Co., 1938), p. 105.

clearly by means of the MF scale, as is shown by the following critical ratios of the differences in mean scores:

Age	Men's ± 4 MF Scale	Women's ± 3 MF Scale
16	22.2	18.7
19	20.8	15.9
38	16.2	17.3
Above 3 groups combined	33.4	31.2

Although there is a very great difference between the average interest scores of males and females, there is nevertheless some overlapping between the distributions. One per cent of the males equal or exceed the score of the 25th percentile females, 2 per cent of the males equal or exceed the median female, and 7 per cent of the males equal or exceed the 75th percentile of females (see Table 61). Women overlap the distribution of men to only half this extent. This relationship is indicated by the larger standard deviation for the males than females, as given in Table 60.

TABLE 61

EXTENT TO WHICH THE INTERESTS OF MALES AND FEMALES OVERLAP AS MEASURED BY THE MF SCALE*

Group	Q_1	Median	Q_3
Percentages of males who equal or exceed critical scores based on the records of 350 females:			
100 high-school boys	0	0	2
150 college men	1	3	8
100 adult men	2	3	10
Total of 350	1	2	7
	Q_1	Median	Q_3
Percentages of females who equal or exceed critical scores based on the records of 350 males:			
100 high-school girls	0	0	4
150 college women	0	0	3
100 adult women	0	0	1
Total of 350	0	0	3

* Based on the MF ± 4 scale for men The overlapping may be spuriously low because the data are based on our criterion groups. The data in Table 62 show, however, no difference in critical ratios based on criterion and non-criterion samples

The total overlapping between males and females is as follows: 16.7 per cent among high-school students, 21.5 per cent among college students, 25.0 per cent among adults, and 21.7 per cent among all three groups. As pointed out below, the two sexes become a little more alike as they grow older but the change is not great.

Sex differences in interests quite constant.—The data in Table 62 indicate that the differences in occupational interests of the two sexes remain surprisingly constant over the period from 14 to 38 years of age.

The table contains data from four samples of high-school boys and girls, one sample of college students of both sexes, and one sample of adult men and women. In each case both sexes filled out the unrevised men's blank and were scored on the men's unrevised scales. The table presents the critical ratios of the differences between the means of the two sexes (data regarding the means may be obtained in the original articles). Thus one hundred high-school boys obtain a mean raw score in engineering interest of 5, the one hundred girls a mean score of —170, a difference of 175, which is 9.1 times the standard error of the difference. Perusal of the data in the table makes clear that the two sexes differ with definite consistency at the age levels considered here. This is also shown by the rank-order correlations between the columns of data, which range from .66 to .86, with an average of .82.

The correlations between MF and occupational-interest scores based on the blanks of 285 Stanford seniors are given in the first column of Table 62. These correlate very highly with the differences in scores of the two sexes and with the critical ratios of those differences. The latter coefficients range from .83 to .95, and average .88.

Over the short age range from 13.8 to 19.0 years there is no indication from these figures that the amount of difference in interests of the two sexes is increasing or decreasing. The critical ratios between adult men and women are about 1.0 less than those for high-school and college students, suggesting that the two sexes differ less when adult than at an earlier age.

The high agreement between the data for 13.8-year-old children and males and females much older suggests also that the in-

TABLE 62

DIFFERENCES IN OCCUPATIONAL-INTEREST SCORES OF MALES AND FEMALES

Data Based on Unrevised Men's Scales

Occupational Interest	Correlation with MF[a]	Critical Ratio of Difference between Two Sexes						Average of Critical Ratios
		Junior High School	Senior High School	34 Twins	100 High School	150 College	100 Adult	
		Age 13 8[b]	16.8[b]	16.0[c]	16.2[c]	19.0[d]	38.0[d]	
Artist	—.38	—7.8	—6.7	—2.0	—4.3	—7.7	—3.9	—5.4
Psychologist	—.05	0.6	1.5	0.8	0.8	—1.7	0.2	.4
Architect	—.01	—3.3	—2.4	0.0	—0.5	—4.2	—1.3	—2 0
Physician	.01	—0.2	1.3	2.5	2.2	—0.5	—0.7	.8
Dentist	.28	...	...	...	...	3.3	0.8	2.1
Mathematician	.14	...	...	0.6	1.5	—0.4	—0.6	.3
Physicist	.38	3.0	4.9	4.4	5.3	2.3	3.0	3.8
Engineer	.69	8.5	9.8	9.1	9.1	8.0	8.1	8.8
Chemist	.50	6.2	6.4	7.5	6.8	5.5	5.5	6.3
Farmer	.68	7.0	6.3	6.0	9.0	10.0	3.9	7.0
Y.M.C.A. physical director	.01	...	...	...	...	0.6	—1.4	—.4
Personnel manager	.08	4.2	2.7	—0.2	0.7	0.8	2.7	1.8
Y.M.C.A. secretary	—.27	1.1	—1.2	—1.9	—3.4	—2.5	—3.6	—1.9
City school superintendent	—.38	...	...	—3.1	—3.4	—2.2	—1.9	—2.7
Minister	—.57	—1.3	—3.5	—2.7	—5.3	—6.9	—6.1	—4.3
Teacher	—.23	0.8	—0.8	—1.8	—3.5	—2.4	—3.4	—1.9
Musician	—.18	...	...	...	...	...	—5.6	—5.6
C.P.A.	—.05	—3.4	—0.8	—5.4	—4.6	0.6	2.2	—1.9
Accountant	.39	...	...	...	...	5.6	3.3	4.5
Office man	.21	...	...	—0.1	—1.3	3.7	—0.3	.5
Purchasing agent	.55	9.6	6.2	4.1	6.3	7.4	5.0	6.4
Vacuum-cleaner salesman	.10	2.5	0.9	0.5	—0.5	...	...	.9
Realtor	—.20	—2.3	—1.9	—1.9	—0.9	—0.8	0.7	—1.2
Life insurance salesman	—.36	—2.6	—3.6	—3.9	—4.7	—2.6	—3.2	—3.4
Advertising man	—.61	—6.9	—5.7	—3.9	—4.6	—8.1	—1.3	—5.1
Lawyer	—.52	—3.2	—1.9	—2.8	—2.3	—3.4	—0.3	—2.3
Journalist	—.64	—6.5	0.0	—3.6	—4.4	—8.8	—3.0	—4.4

[a] Based on old scales. Correlations based on revised scales and MF ± 4 scale are given in Table 87, p. 324.

[b] From F. H. Finch and M. E. Odoroff, "Sex Differences in Vocational Interests," *Journal of Educational Psychology* (1939), 30, 151–56. N = 127 boys and 106 girls in junior high and 120 boys and 112 girls in senior high.

[c] From H. D. Carter and E. K. Strong, Jr., "Sex Differences in Occupational Interests of High-School Students," *Personnel Journal* (1933), 12, 166–75.

[d] From E. K. Strong, Jr., "Interests of Men and Women," *Journal of Social Psychology* (1936), 7, 49–67.

terests measured by the interest blank are well established at this early age.[24]

AGE AND MF

Masculinity-femininity scores change relatively little with age. Data upon 7,753 males and 372 females are given in Table 63 and plotted in Figure 13. The first column (M) of the table gives the mean scores of the three criterion groups of males, the second column (W) gives the corresponding means of females. The MF scale and its norms are based on these two sets of data. The third column (A) presents the mean score of a good sample of 15-year-old boys.[25] The fourth column (B) records the mean scores by age of the 1,000-men group, representative of adult males in the United States. The fifth column (C) comprises 1,412 cases which were scored in our office. The sixth column (D) includes at least 100 cases each from 34 occupations, which were included in our occupational-criterion groups. The last column gives averages of all the data at the various age levels.

In general, the data show a slight downward trend with increasing age, i.e., toward feminine interests, with our two criterion groups (M and W), with our 1,000-men group (B) and our occupational-criterion groups (D), but not with data taken at random from blanks being scored in our office (C). The decrease in column M of 4.6 standard scores between 16 and 37 years of age has a critical ratio of 3.5 and the decrease in column B of 5.7 standard scores between 21 and 52 years has a critical ratio of 4.5; but the decrease in column D of 2.3 standard scores between ages 23 and 57 has a ratio of only 1.9. As far as our data go, there is a decrease in masculinity among males between 16 and 50, but it amounts to only a few standard scores.

[24] In discussing the differences in interests of boys and girls, as given in column five of Table 62, Carter and Strong called attention to the fact that occupations on which the boys scored higher than the girls were occupations which correlated negatively with interest maturity, whereas occupations on which the girls scored higher correlated positively with IM. That was true as regards the old IM scale but does not hold for the revised 15–25-year-old IM scale; in the former case the correlation between differences in interests of the two sexes and IM was .73, in the latter case the correlation is —.06. Maturity of interests cannot now be used in explaining the differences in interests of the two sexes.

[25] See Table 191, p. 715.

TABLE 63

AGE AND MF SCORES ON MEN'S BLANK

Age	M		W		A		B			C			D			E
	Criterion-Group Males		Criterion-Group Females		15-Year-Old Boys		1,000 Men			Through Office			Occupational Criterion Groups			Total, Excluding W
	N	Mean[a]	N	Mean[a]	N	Mean[b]	N	Mean	σ	N	Mean	σ	N	Mean	σ	Mean
15	...	....	...	....	424	51.2	...	....	....	21	46.5	10.1	...	....	...	51.0
16	129	52.3	129	30.1	...	....	...	....	....	56	47.6	9.4	...	....	....	50.9
17	...	....	...	....	...	....	...	....	....	200	48.0	10.6	...	....	...	48.0
18	...	....	...	....	...	....	...	....	....	200	47.8	10.4	...	....	...	47.8
19	143	49.5	143	26.6	...	....	...	....	....	200	46.8	11.4	...	....	...	47.9
20	...	....	...	....	...	....	...	....	....	200	49.3	11.4	...	....	...	49.3
21	...	....	...	....	...	....	205[c]	49.7	9.7	200	48.9	11.1	...	....	...	49.3
22	...	....	...	....	...	....	...	....	....	136	49.5	9.1	...	....	...	49.5
23	...	....	...	....	...	....	...	....	....	90	48.1	11.2	113[d]	46.1	9.2	47.0
24	...	....	...	....	...	....	...	....	....	68	44.9	11.4	...	....	...	44.9
25	...	....	...	....	...	....	...	....	....	41	46.7	10.7	...	....	...	46.7
25-29	...	....	...	....	...	....	169	52.8	9.1	...	....	....	516	46.5	9.5	48.1
30-34	...	....	...	....	...	....	131	51.6	10.1	...	....	....	780	47.1	9.3	47.7
35-39	100	47.7	100	26.8	...	....	144	44.3	9.7	...	....	....	883	46.7	9.2	46.5
40-44	...	....	...	....	...	....	107	40.6	10.2	...	....	....	777	46.3	9.6	45.6
45-49	...	....	...	....	...	....	106	55.1	8.2	...	....	....	658	45.6	9.5	46.9
50-54	...	....	...	....	...	....	77	44.0	8.1	...	....	....	486	44.4	9.5	44.3
55-59	...	....	...	....	...	....	61	32.2	7.9	...	....	....	317	43.8	9 3	41.9
60-64	...	....	...	....	...	....	...	....	....	...	....	....	15	43.9	8.1	43.9
Total	372	....	372	....	424	....	1,000	....	....	1,412	....	....	4,545	....	...	....
Mean	...	50.0	...	27.9	...	51.2	...	47.8	....	....	48.0	....	...	46.0	...	47.1

[a] Standard deviations of Group M are, respectively, 8.2, 10.8, and 10.2; those of Group W are 7.9, 7.6, and 7.9.
[b] Standard deviation is 7.0.
[c] Age 18 to 24.
[d] Age 20 to 24.

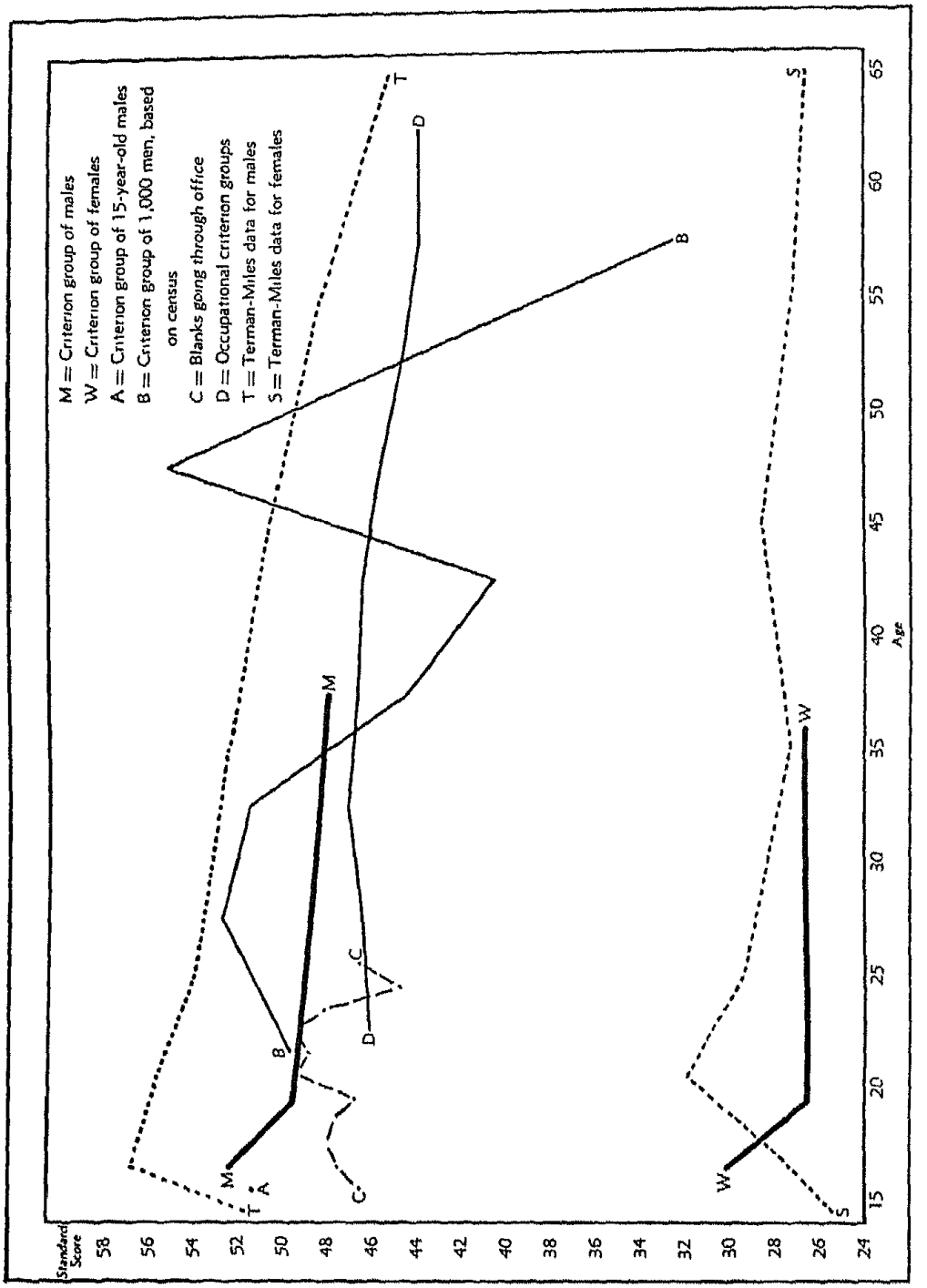


FIG. 13.—Age and MF score

Terman and Miles[26] have reported similar findings with their MF test but of greater magnitude. Their data, converted into standard scores, are shown for males in curve T and for females in curve S (Figure 13). Their males drop from 56.8 at age 16 years, to 48.2 at age 55, and to 43.8 at age 75. Their females also drop (become more feminine) from 31.9 at age 20, to 27.1 at age 75. Were it not for a rise in masculinity in both sexes during adolescence, their results would agree very closely with ours. We both agree in that females become slightly more feminine and males become somewhat more feminine in interests with age, so that both sexes approach each other a little as they become older but even at age 60 the difference between the two sexes on these test scores is still very great.

Terman and Miles report, furthermore, an increase in masculinity for males from age 14 to "somewhere during the high-school years," and a decrease from then on; and an increase in masculinity for females "from early adolescence to early maturity, the peak of masculinity being reached in the college years,"[27] and from then on a decrease until old age. Our data on this point for males are somewhat conflicting when scores from different samples are considered; at best our data cannot be said to confirm Terman and Miles. Our data for females, however, are directly opposed to their findings—16-year-old girls score more masculine than 19-year-olds, not the reverse.

Offhand inspection of data in Table 63 and in Figure 13 raises the query whether our standard scores are satisfactory, for it seems as if most age groups average below 50. It is, however, the scores of the older men which are largely responsible for the means being below 50. The mean score for the 1,000-men group, ages 18 to 39, is 49.7, and that for ages 18 to 49 is 49.2. This affords a quite satisfactory check on our standard score of 50.0 for the test.

We suspect the explanation for the mean scores of the three groups, mentioned above, being 46.0 to 48.0 is due to the fact that MF correlates —.41 with OL. Our occupational-criterion groups represent successful men for the most part from the upper

[26] *Op. cit.*, p. 123.

[27] *Ibid.*, pp. 122–23.

socio-economic levels. In consequence, they should score on the average below 50, as they actually do, i.e., 46.

OCCUPATIONAL INTERESTS AND MF

Mean MF scores for 34 occupations are given in Table 87 (p. 324), also the correlations between occupational-interest scores and MF scores on 285 blanks of college seniors. The two sets of data agree very well, although based on entirely different blanks, as they have a rank-order correlation of .858. The correlational data are plotted in Figure 23 (p. 328), which aids very considerably in appreciating their significance.[28] Ignoring for the moment a few discrepancies in the two sets of data, we may conclude that the following groups of occupations have masculine interests, i.e., Group III (production manager), Group IV (farmer, etc.), Group II (engineer, etc.), Group VIII (purchasing agent), and Group XI (president), although the last two are only very slightly masculine. The remaining occupational groups are feminine in interests, i.e., Group I (artist), Group V (Y.M.C.A. secretary), Group VII (C.P.A.), Group IX (realtor), Group VI (musician), and Group X (advertising man). Seven discrepancies in the two sets of data may be noted: sales manager is masculine on the basis of mean score (51.8) but feminine in terms of correlation (—.31); mathematician and physicist are feminine in mean score (47.8 and 47.3, respectively) but masculine in terms of correlation (.11 and .37, respectively); and farmer, policeman, mathematics-science teacher, and accountant are only slightly masculine in mean score, averaging 50.7, but distinctly masculine on the basis of correlation, averaging .51. In general, occupations dealing with objects including office records score masculine while occupations dealing with people and with artistic, musical, and linguistic activities score feminine.

If occupations are classified as masculine or feminine on the basis of differences in mean scores of males and females, as in Table 62, essentially the same grouping results as given above. It is gratifying that such extremely high agreement is obtained

[28] Figures 23 to 26 (pp. 328–29) aid materially in understanding how occupations are distributed in terms of MF in relationship to IM and OL.

from three entirely different sets of data handled in three different ways.

MF has far less association with occupational interests among women than among men. Correlations between MF and occupations range from .79 to —.74 among men but only from .29 to —.47 among women (see Tables 193 and 194, facing p. 716 and p. 718). It is true that the MF test used with the women's blank is based upon only the 263 items common to the men's and the women's blanks and for this reason it has a lower reliability. But aside from this fact of fewer items there is apparently nothing about the women's MF scale which should make it inferior to the men's, unless it is that women cannot display their complete range of masculinity-femininity when scored upon items originally selected for men. Anyway, all but five women's occupations correlated between .20 and —.20 on the women's MF scale. The five are: physician, .29; dentist, .29; mathematics-science teacher, .27; Y.W.C.A. secretary, —.29; and English teacher, —.47.

It should be noted that the interests of housewives correlate —.03 with MF; their mean score is 51.9 on the women's FM scale. A housewife is only slightly more feminine in her interests than the average woman. All this emphasizes that MF scores are not to be associated with the physical attributes of sex.

Whatever causes MF, it is something which does not particularly differentiate women's occupations but contributes a very considerable amount to the differentiation of men's occupations.

Drs. Abraham Myerson and Rudolph Neustadt have reported that many men produce, along with their regular male sex hormones, an excess quantity of feminine sex hormones and, furthermore, that this excess quantity of feminine sex hormones varies considerably in men.[29] It would be very interesting to determine whether or not there is any relationship between amount of sex hormones and MF interests.

The general conclusion from many studies is that girls and women are superior to males in language ability and similarly boys and men are superior to females in mathematics. The differences are not large, but such as they are appear rather consist-

[29] Richmond meeting of American Psychiatric Association, 1941.

ently as stated. The former relationship is supported by interest scores but not the latter. Women clearly score higher on the author-journalist scale than men, but on the mathematician and mathematics-science teacher scales the two sexes score very much alike. On the applied-mathematics scales, however, such as engineer, chemist, and physicist, men score higher than women.

Conclusions of Terman and Miles.—Terman and Miles discuss the relation of MF score to occupation. The rank-order correlation between scores for certain occupations on their scale and ours is .36, which is about the correlation between the two tests as reported on page 223. Their general conclusion regarding occupation and MF is:

> Consideration of the positions of these main activity groupings of men shows certain new and important trends. (1) Mechanical occupation is strongly masculine in its influence, but it does not entirely obliterate the effect of educational level. (2) Social or humane pursuits, those concerned with people rather than with things, have a feminine influence, but they do not eliminate the effect of education on the score. (3) Culture and philanthropy, concerns of the spirit as contrasted with material objectives, have a profoundly feminizing influence. Apparently this is as strong as the influence of age, and in groups of any size it tends to override and obliterate almost completely the effect of the educational level.[80]

This statement well expresses one essential difference between the Terman-Miles MF test and our own, namely, that education and presumably intelligence influence their MF scores to a greater degree than our MF scores. They report that college-educated engineers have the highest MF score, i.e., 60.8, which is the most masculine of all occupations. But mechanical occupations (draftsmen, electricians, machinists, and truck drivers) and building trades average only 51.6. According to our findings engineers score highest (61.9) but carpenters score 58.6, not 49.2 as on the Terman-Miles test. According to Terman and Miles the mechanical skilled trades score 6.8 standard scores lower than engineers and architects because of "(1) general educational difference and (2) a difference in specialization of mechanical training."[81]

It is a little difficult to understand what is meant by the statement of Terman and Miles that "mechanical occupation is strongly masculine." Seemingly it is not mechanical activities that are

[80] Terman and Miles, *op. cit.*, pp. 161–62. [81] *Ibid.*, p. 171.

masculine but college engineers alone. Surely the building trades are more mechanical than the occupations of clerical people and pharmacists, yet on their test the building trades score one standard score lower.

Just who are referred to under the heading "(2) social or humane influence, those concerned with people rather than things" is not clear. There do not seem to be any occupations of this type which are feminine except policeman and fireman. Teachers score 51.5, salesmen 54.1, and policemen and firemen 48.1: these are the only groups listed in their Table 35 which could seemingly come under the second group, and only policemen and firemen score below the mean. Terman and Miles have this to say about these two public-safety occupations:

> We are inclined to interpret the low score as evidence of the social-welfare influence which, as already noted, tends to operate in the feminine direction. . . . . It is surely significant that in the policemen and firemen the influences (1) of educational limitation, (2) of social-welfare interest, and (3) of the absence of marked mechanical interest and financial objectives operate to produce a score placement which approximates that of the highly cultured vocational group [composed of editors, journalists, clergymen, and artists].[32]

Our own data (Table 87, p. 324) support the view expressed by Terman and Miles, for our occupational Group V comprises occupations with standard scores ranging from 50.7 to 35.1, with an average for the six of 43.4; but we fail to see any proof in their data, possibly because they do not have data for the appropriate occupations, to support the contention that social or humane influences are feminine.

The third group of Terman and Miles is undoubtedly feminine according to their data. They include within it editors, journalists, clergymen, and artists. The first two score 48.3, ministers score 45.6, and artists 44.8. Our own data support this point of view with the following feminine scores: journalists, 31.8; clergymen, 35.1; artists, 33.0; and musicians, 40.6; other low MF score occupations are: advertising man 39.0, architect 43.8, Y.M.C.A. secretary 40.0, social science teacher 42.9, city school superintendent 44.6, and life insurance salesman 42.4, to name only

[32] *Ibid.*, p. 175.

those below 45.0. It may be appropriate to classify such a group as cultural; but to the writer it seems far better to restrict the name to what is definitely involved in the occupations concerned, i.e., to say that the literary, the linguistic, the religious, the artistic, and the musical occupations are feminine. In addition, the occupations dealing with people, i.e., selling to them or influencing them for their presumed good are feminine.

Extremely high and low MF scores.—A number of blanks have been collected during recent years from people of both sexes who score close to the upper and lower percentile for their sex. For the men these extreme cases average 71 and 19 standard scores and for the women 50 and 12 on the men's blank (see Table 60). The mean occupational ratings for these four extreme groups are given in Table 64. Evidently men and women in the lower percentile of their own sex on the MF scale score very much alike (correlation of .95). But the reverse is not so true, for men and women with very high MF scores correlate only .59. These results hold not only when the two sexes are compared but also when men are compared individually with men and women with women. All of the 20 cases with very low scores have quite similar profiles, but there is marked variation among the 15 cases with very high scores. Expressed in another way, some men have the capacity to score almost as feminine (standard score of 19) as the most feminine of women (score of 12) and in doing so secure profiles practically identical with these women. But so far no records of women have been discovered which at all approximate the records of men with extremely high MF scores.

Four of the eleven men with very low MF scores are ministers (scores of 11, 11, 17, and 18); two are artists (MF scores of 20 and 22); three are author-journalists (20, 20, and 22); one is an accountant (22), and one a law student (23). Of the six men with MF scores of 70 to 72, one each are a commercial aviator, an accountant, an engineer, and a production manager, and two are sales managers. Of the nine women with high MF scores we have the occupational records of only four: one is a high-school and another a college student majoring in chemistry, one is a college senior majoring in engineering, and another has just graduated in this subject and is at present employed as a draftsman.

TABLE 64

MEAN OCCUPATIONAL RATINGS OF MEN AND WOMEN WITH EXTREMELY HIGH OR LOW MF SCORES

Dashes indicate mean scores of 20 or less

MF Scale	Maximum MF Score of Their Sex		Mean MF Score of Their Sex		Minimum MF Score of Their Sex	
	6 Men Score 71	9 Women Score 50	10 Men Score 52	10 Women Score 27	11 Men Score 19	9 Women Score 12
Production manager	A	B	B	..	—	—
Farmer	B+	B+	B	..	—	—
Engineer	A	..	..	..	—	—
Carpenter	..	..	—	—	—	—
Forest service	..	..	..	—	—	—
Policeman	B	B	..	—	—	—
Mathematics-science teacher	..	B	..	..	—	—
Purchasing agent	A	..	B	..	—	—
Chemist	A	B	..	..	—	—
Printer	..	B	..	..	..	..
Accountant	..	..	B	..	—	—
Office man	..	..	B+	..	—	..
Dentist	..	..	—	..	..	..
Mathematician	..	..	—	..	..	..
President	B+	..	..	..	B	..
Banker	—	..	B	..	..	..
Y.M.C.A. physical director	—	..	..	..	..	..
Physician	..	B	—	B	B+	B
Personnel manager	..	..	..	..	..	..
Architect	..	..	—	B	B+	B
Psychologist	—	..	—	..	..	..
Realtor	B	..	B+	B	B+	B+
C.P.A.	..	..	..	B	..	..
Sales manager	B	..	B	..	..	..
Y.M.C.A. secretary	—	..	..	..	..	..
Social science teacher	—	..	..	..	..	..
Musician	—	..	—	B+	B+	A
Artist	—	..	—	B	A	A
Life insurance salesman	..	..	B	B	B+	B+
City school superintendent	—	—	—	..	..	..
Minister	—	..	—	..	B	..
Lawyer	..	..	..	B+	A	A
Author-journalist	..	..	..	B+	A	A
Advertiser	..	..	..	B+	A	A
OL	57	50	57	59	65	62
Correlation between two sets of mean scores	.59		—.03		.95	

Is there any evidence of abnormality in women with high, i.e., masculine, and men with low, i.e., feminine, MF scores? Terman and Miles report that women athletes score high on their scale. We have insufficient data on this matter but do find that women with high MF scores are interested in the physical sciences. As regards men with low MF scores, Terman and Miles report that passive homosexuals have such scores. No such study has been made with our scale as far as known to us. One case with a raw score of —175 on the ±3 MF scale, which is lower than the 100 percentile for women, had markedly feminine mannerisms coupled with paranoid delusions which necessitated his parents' placing him in the care of a psychiatrist. Dr. R. T. Ross, who has accumulated considerable data on the subject, has reported personally to the writer that passive homosexuals score low on MF but that many who score low are not homosexuals. Walker,[38] however, concludes that among prison inmates "passive homosexuals . . . . are just as likely to make a high masculine score as a high feminine score" on the Terman-Miles test.

Our present point of view is that counselors should consider a low MF score by a man as a danger signal unless he has significantly high scores on those occupations which correlate negatively with MF. The difficulty may be passive homosexuality or emotional upset of some sort. One business student with no B+ or A ratings and very few B ratings and a low MF score was terribly upset over an unfortunate love affair. Later when he was able to laugh about the matter his MF score was much higher and his interest profile was normal for business interests, i.e., had many B and some B+ ratings in business pursuits.

CHARACTERISTICS OF MASCULINE AND FEMININE INTERESTS

Women like 213 items more than men do on the original interest blank for men, and men like 190 items more than women (17 items are tied). But this relationship does not hold for occupational items, for here men prefer 7 more than women. When the list of 100 occupations which are supposedly of primary interest to men is considered, it is surprising that this difference is

[38] E. L. Walker, "The Terman-Miles MF Test and the Prison Classification Program," *Journal of Genetic Psychology* (1941), **59**, 27–40.

so small. Women, however, like 10 more school subjects, 7 more activities, and 19 more peculiarities of people than men.

Part VIII of the blank lists 40 abilities, and the subject is requested to indicate whether he possesses the trait or not. In only three cases was there any particular difference in the responses of the two sexes; more men than women reported they "were quite sure of themselves," "have mechanical ingenuity," and "frequently make wagers." Some of the items on which both sexes rated themselves practically equal are: Usually start activities of my group, win friends easily, accept just criticism without getting sore, have more than my share of novel ideas, am always on time with my work, get "rattled" easily, am approachable, etc. It has frequently been claimed that women worry more about mistakes and have their feelings hurt more easily than men. Possibly they do, but they do not think they do any more than men.

The same situation is true regarding the ten factors affecting one's work—in only one case did the two sexes differ and here it was the females who insisted slightly oftener than the males that "opportunity to understand just how one's superior expects work to be done" was important.

Whether or not men and women possess these qualifications is a question upon which our data can throw no light, but they do emphasize most distinctly that each sex rates itself in the same way as the other does.

Items preferred by males.—Table 65 lists the ten items most liked by males in comparison with females, the ten items most liked by females in comparison with males, and ten items on which they agree exactly. From data of this sort for the entire 420 items we have classified the distinctly masculine interests, as follows:

1. *Mechanical, scientific activities,* e.g., repairing electrical wiring, machinist, manual training, *Popular Mechanics,* physics, carpenter, factory manager, chauffeur rather than chef, calculus, author of technical book (total of 46 items).[84]

[84] Carter reports distinctly greater breadth of interest among 11- to 15-year-old boys than girls in mechanical-scientific interests; her data are conflicting with respect to interest in physical activity and intellectual-cultural interests when both urban and rural children are considered. Her three categories correlated about .63. E. H. Carter, "The Interest of Adolescents in Physical, Mechanical-Scientific, and Intellectual-Cultural Pursuits: A Cumulative and Comparative Study," unpublished Doctoral dissertation, University of California Library, 1939.

TABLE 65

EXAMPLES OF DIFFERENCES IN LIKING ITEMS BETWEEN MALES AND FEMALES

(N = 350 of each sex)

Rank Order	Item No.	Items	Percentage Who Like the Item			Scoring Weight	Critical Ratio
			Males	Females	Difference		
1	188	Repairing electrical wiring	55	13	42	4	13.1
2	190	Operating machinery	65	25	40	4	11.6
3	187	Adjusting a carburetor	44	6	38	4	12.9
4	139	Hunting	64	28	36	3	10.8
5	304	Ford[a]	50	15	35	4	10.7
6	32	Electrical engineer	42	7	35	4	11.8
7	121	Manual training	57	23	34	3	9.8
8	180	*Popular Mechanics*	62	28	34	3	9.7
9	60	Mechanical engineer	41	8	33	4	11.0
10	24	Civil engineer	43	11	32	4	10.2
194	217	Bargaining	22	22	0	0	....
195	21	Cashier in bank	24	24	0	0	....
196	245	People who have made fortunes in business	40	40	0	0	....
197	221	Expressing judgments publicly	28	28	0	0	....
198	268	People who talk very loudly	2	2	0	0	....
199	269	People who talk very slowly	13	13	0	0	....
200	278	Men who use perfume	3	3	0	0	....
201	290	Interest the public in the machine[a]	15	15	0	0	....
202	380	Plan my work in detail[b]	49	49	0	0	....
203	387	Am approachable[b]	77	77	0	0	....
411	172	Poetry	27	62	—35	—3	10.0
412	74	Private secretary	18	55	—37	—4	11.0
413	233	Looking at collection of antique furniture	21	59	—38	—4	11.1
414	39	Florist	11	49	—38	—4	12.1
415	53	Librarian	14	53	—39	—4	12.0
416	119	Literature	38	77	—39	—4	11.4
417	233	Looking at collection of rare laces	7	48	—41	—4	13.7
418	258	Tall men preferred to short men	26	68	—42	—4	12.3
419	43	Interior decorator	17	60	—43	—4	13.0
420	194	Decorating a room with flowers	19	81	—62	—4	20.9

[a] First three and last three preferences asked for among 10. This item included among the first three.

[b] From last section of blank; subjects are asked to "indicate what kind of a person they are right now and what they have done." Replies are "Yes," "?," and "No," instead of like, indifference, and dislike.

2. *Physically strenuous, adventuresome activities,* e.g., boxing, hunting, drilling soldiers, reading sporting pages, fishing, playing baseball, reporter of sporting pages, pursuing bandits in a posse, auto racing, military drill (total of 11). But women like tennis and taking long walks more than men.
3. *Legal, political, and army occupations,* e.g., army officer, corporation lawyer, politician, judge, governor of a state, being pitted against another as in a political or athletic race (total of 9).
4. *Selling activities,* e.g., auto salesman, stock broker, wholesaler, traveling salesman, retailer, auctioneer, canvassing preferred to gardening (total of 7). But women prefer certain phases of selling closely related to commodities bought by them (see below).
5. *Certain forms of entertainment,* e.g., smokers, billiards, rough-house initiations, performing sleight-of-hand tricks, poker, chess, *Judge* (total of 7). See below for forms of entertainment liked more by women than by men.
6. *Miscellaneous items,* e.g., outside work preferred to inside, work for self, am quite sure of myself, treasurer of a society, etc. (total of 9).

Items preferred by females.—From the data we have classified distinctly feminine interests as follows:

1. *Musical, artistic activities,* e.g., decorating a room with flowers, looking at a collection of antique furniture, landscape gardener, art galleries, symphony concerts, artist, dramatics, organizing a play, musician, sculptor, "arts and crafts," actor, orchestra conductor (total of 22 items).
2. *Literary activities,* e.g., librarian, literature, poetry, languages, spelling, magazine writer, *Atlantic Monthly,* English composition, author of novel (total of 13).
3. *Kinds of people, largely unfortunate and disagreeable,* e.g., talkative people, foreigners, people who borrow things, women cleverer than you, fashionably dressed people, nervous people, sick people, quick-tempered people, religious people, people who talk about themselves, very old people, pessimists, people who talk very fast, blind people, cripples, witty people (total of 21). The only kind of people preferred by men more than women is "men who chew tobacco."
4. *Certain forms of entertainment,* e.g., fortune tellers, picnics, full-dress affairs, pet canaries, entertaining others, social-problem movies, excursions, chairman of entertainment committee, solitaire (total of 9).
5. *Clerical work,* e.g., private secretary, typist, shorthand, office clerk, penmanship, typewriting, bookkeeping, secretary of a society (total of 9).
6. *Teaching,* e.g., music teacher, teaching children, school teacher (total of 5).

7. *Social work,* e.g., social worker, raising money for a charity, contributing to a charity, playground director, giving first-aid assistance (total of 6).
8. *Relating to merchandise,* e.g., looking at shop windows, buying merchandise for a store, displaying merchandise in a store, buyer of merchandise, auctions, florist, jeweler (total of 7).
9. *Certain school subjects,* e.g., Bible study, botany, sociology, philosophy, nature study (total of 5).
10. *Miscellaneous,* e.g., tall men preferred more than short men, writing personal letters, raising flowers and vegetables, planning for immediate future preferred more than for five years ahead, living in the city, opening a conversation with a stranger, interpreter, employment manager, secretary of chamber of commerce, photo engraver (total of 14).

Probably no two persons would group the items above in the same manner. The writer has listed many examples under each heading so that the reader may decide whether or not he agrees with the several headings. It would be easy to say that men prefer things more than people and women the reverse. Women, however, like merchandise with which they come in contact in normal life more than men, and they like things which may be classified as artistic, musical, or literary more than men. Men, on the other hand, like 32 peculiarities of people as well as the women, but they do not like 19 other peculiarities quite as well as the women. In none of these cases is the difference statistically significant. It would also be easy to say that men like dirty things and women dislike them. Presumably women dislike dirty things, but it is questionable if men like to fix a carburetor or repair electrical wiring because of the dirt aspect. There is probably no football player who finds his enjoyment increased by playing in the rain or on a dusty field.

The headings here are given because they are interesting to think about. Only a very long detailed analysis will give us the real elements that differentiate men and women with respect to their interests.

Terman and Miles summarize the difference between men and women as follows:

> It is obvious that from whatever point we have started, whether from the knowledge shown by the sexes or from their associations or their likes

and dislikes for people, vocations, pastimes, books, or objects of travel; or whether we have explored directly or deviously their emotions, tastes, opinions, and inner experiences, we have found ourselves arriving at much the same conclusions—all our ways have led to Rome. But the final scene has two aspects—two sides of the same picture—one showing differences in the direction of interest, the other differences in the direction of emotions and impulses.

From whatever angle we have examined them the males included in the standardization groups evinced a distinctive interest in exploit and adventure, in outdoor and physically strenuous occupations, in machinery and tools, in science, physical phenomena, and inventions; and, from rather occasional evidence, in business and commerce. On the other hand, the females of our groups have evinced a distinctive interest in domestic affairs and in aesthetic objects and occupations; they have distinctively preferred more sedentary and indoor occupations, and occupations more directly ministrative, particularly to the young, the helpless, the distressed. Supporting and supplementing these are the more subjective differences—those in emotional disposition and direction. The males directly or indirectly manifest the greater self-assertion and aggressiveness; they express more hardihood and fearlessness, and more roughness of manners, language, and sentiments. The females express themselves as more compassionate and sympathetic, more timid, more fastidious and aesthetically sensitive, more emotional in general (or at least more expressive of the four emotions considered), severer moralists, yet admit in themselves more weaknesses in emotional control and (less noticeably) in physique.

But we must define some of our terms more precisely, for instance, "aggressiveness" and "self-assertion." The evidence is for initiative, enterprise, vigorous activity, outdoor adventure; "aggressiveness" need not imply selfishness or tyranny or unfair attack. The compassion and sympathy of the female, again, appears from the evidence personal rather than abstract, less a principled humanitarianism than an active sympathy for palpable misfortune or distress. In disgust, in aesthetic judgment, and in moral censure, the evidence is rather for the influence of fashion and of feeling than of principle or reason. Our evidence need not imply the possession of a "truer" taste or a more discerning conscience.[85]

There is no contradiction between our summary and that of Terman and Miles, but the latter points out differences in emotional attitudes which are not indicated by our data. This is because their test includes four sections not found in ours which provide opportunity for expression of anger, fear, disgust, pity, and ethical attitudes.

[85] Terman and Miles, *op. cit.*, pp. 447–48.

Chapter 12. The Interest-Maturity Scale

Certain interests decrease and other interests increase with age. "Walking along the edge of a precipice" does not appeal to older men as it did when they were boys, whereas "raising flowers and vegetables" is liked by many more adult men than 15-year-olds. Some of the questions considered in this and the next chapter are:

1. Do men have more or fewer interests as they grow older?
2. Are there certain types of interests peculiar to youth and other types characteristic of maturity and of old age? If so, do some types of interests wax and some wane with age?
3. Do changes in interests become progressively greater and greater or less and less with age? Or do changes in interests occur equally from decade to decade?
4. Are changes in interests significantly great or small?
5. Is there a general shift in interest from liking to disliking or the reverse, or from either liking and disliking to indifference or the reverse? Burnham has suggested that a shift from liking to indifference is an indication of increasing blaséness or sophistication, while a shift from disliking to indifference is indicative of a trend toward liberalism.[1] Is there any indication that such shifts take place with age?
6. Are changes in interests characteristic of all occupations or do men in each vocation have changes in interests with age peculiar to that occupation?
7. What effect, if any, do changes of interest with age have upon the interpretation of scores of the *Vocational Interest Blank?*
8. A related question not considered here is: What is the effect, if any, of such changes in interests upon the employment of the young and old?

[1] P. S. Burnham, "Stability of Interest Test Scores" (unpublished Doctoral dissertation, Yale University, 1935), pp. 59–61.

This chapter is primarily concerned with the development of an interest scale to measure the changes of interest accompanying increasing age among men. Some attention is given to the original interest-maturity scale,[2] since it has been used rather extensively. Its defects are pointed out in order to show the need for a revised scale.

THE FIRST INTEREST-MATURITY SCALE

Interest maturity was originally defined as the "quantitative measurement of change of interests with age . . . . the degree to which one has the interests of 55-year-old men as compared with those of 15-year-old boys."[3]

The first interest-maturity scale, published in 1933, contrasted the interests of 15- and 55-year-old men. The 15-year-old group was carefully selected so as to constitute a good sample of 15-year-old boys in California (see Table 191, p. 715). Unfortunately, at that time it was not possible to secure a good sample of 55-year-old men and hence the scale was based on such records as were available (see Table 192, page 716, also the original article for details).

This 55-year-old group represented successful men, for nearly all the blanks had been secured on that basis for some occupational-criterion group. It was furthermore representative of professional men and staff men in business but contained few line executives and no skilled or unskilled workers. It was pointed out at the time that this interest-maturity scale, based on these two samples of 15- and 55-year-old men, expressed changes in both age and education, also differences between 15-year-old boys as found in California schools and the more successful men engaged in the better-paid and socially more approved professions and business activities. It was unfortunate that there had to be this complication. The scale, as it stood, was believed to have real value for guidance purposes, as it measured changes in interest in the direction of those possessed by superior adult men.

[2] E. K. Strong, Jr., "Interest Maturity," *Personnel Journal* (1933), **12**, 77–90.

[3] The revised interest-maturity scale, discussed below, contrasts the interests of 15- and 25-year-old men, so that 25 should be substituted for 55 in this definition in order to fit it to the revised scale.

Curve C of Figure 14 was published originally to represent the changes in interests with age. The curve indicates a rapid rise in score from age 15 to about age 21, then a more gradual rise to about age 50, and from there on a slight decline. Curve B is intro-

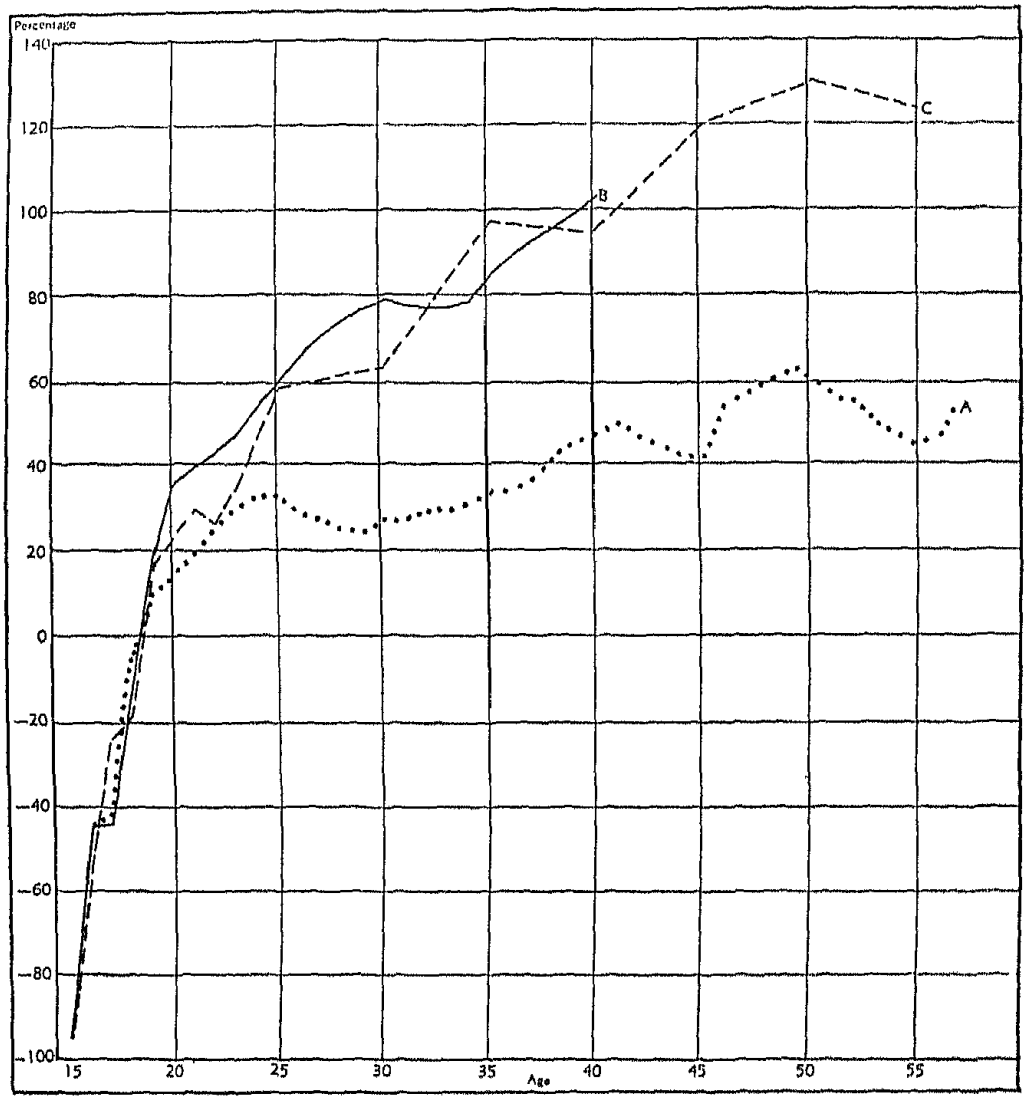


FIG. 14.—Mean scores on original interest-maturity scale according to age. Curve *A*—"Census group" records; Curve *B*—High-school and college students; Curve *C*—3,165 cases, primarily high-school and college students. Original IM scale standardized on this basis. All three curves start with 15-year criterion group. The first two curves are smoothed curves from 18 years upward.

duced at this time to show that the trend in Curve C is paralleled by data based exclusively on high-school, college, and graduate students, which, of course, reflect simultaneously increasing chronological age and educational attainment. Curve A, which is based on records of our 1,000-census group, representative of men in the United States, portrays, on the other hand, relatively slight change in interests with age from about age 23 to age 55.

Berman, Darley, and Paterson concluded that the original IM scale was a "composite measure of age and occupational level."[4] They did not consider differences in educational status and we did not consider differences in occupational level; hence it is not known whether their "occupational level" and our "educational status" are separate factors or expressions of the same factor. But it is clear that the old scale was materially affected by such elements and hence does not measure changes of interests with age alone.

Need for a revised IM scale.—The foregoing makes clear that the old scale had to be revised in order to free it from undue influence of educational and occupational attainment if the scale is to represent changes in interests accompanying increasing age with the other two factors minimized. There is no thought here, of course, of obtaining a scale which is entirely unaffected by education. To begin with, such a scale is impossible, since the average man has had several years of schooling and without that schooling could not fill out the *Vocational Interest Blank* or any other similar questionnaire. And even if such a scale could be evolved, it is difficult to see of what advantage it would be. We are desirious of obtaining a scale which will represent the changes in interests with age of the average man. To accomplish this it is necessary, first of all, to discard the original 55-year-old criterion group and to substitute for it a criterion group that is a sample of 55-year-old men in this country.

In addition, another change was imperative—a change which did not occur to us in 1933. In contrasting the interests of 15- and 55-year-old men, as a basis for the original IM scale, the as-

[4] I. R. Berman, J. G. Darley, and D. G. Paterson, *Vocational Interest Scales* (University of Minnesota Employment Stabilization Research Institute, 1934), Vol. 3, No. 5, p. 22.

sumption was made that liking increased, or decreased, progressively from 15 to 55 years of age. Since then it has been discovered that for many items this is not true.

Consequently, two things had to be done in order to insure a better IM scale. First, a good sample of men at ages 25, 35, 45, and 55 years had to be obtained. Second, it had to be determined whether changes in interest for each item increased or decreased progressively from age 15 to age 55 or whether such changes progressed from age 15 to some intermediate age and then remained constant or reversed their direction beyond that point.

CHANGE IN INTEREST IN INDIVIDUAL ITEMS WITH AGE

The analysis as to how individual items change in interest with age is based on the records of 4,864 men, of whom 406 were tested twice and 136 three times, making a total of 5,406 records. These records may be grouped, as follows:

1. Criterion groups, aged 15 and 55 years, of original interest-maturity scale.[5] N = 472 and 632, respectively.

2. Eighty pairs of fathers and sons, averaging 58 and 22 years of age.

3. Four age groups, averaging 25, 35, 45, and 55 years, equally representative of eight occupations. N = 604, 759, 581, and 396, respectively.[6]

4. Four age groups, averaging 25, 35, 45, and 55 years, representative of occupations at those ages as given by the *United States Census*. N for age range 22–27 is 215; for 30–39 is 275; for 40–49 is 213; and for 50–59 is 151.

5. Stanford seniors, tested in 1927 and retested in 1932 and 1937, averaging 22.4, 27.4, and 32.4 years of age. N = 136.

6. High-school juniors tested at that time and six years later, averaging 16.5 and 22.5 years of age. N = 162.

7. Stanford graduate students, tested in 1927 and 1932, averaging 25 and 30 years of age. N = 76.

8. Stanford graduate students, tested in 1927 and 1932, averaging 30 and 35 years of age. N = 32.

[5] The various IM criterion groups are described on p. 714.

[6] Described in detail in E. K. Strong, Jr., *Change of Interest with Age* (Stanford University Press, 1931), pp. 12–19.

The most unequivocal data are those from individuals tested at two different times. Where comparisons are made between two different groups of individuals there is always the distrust that the samples may not be alike in all but age as they are supposed to be and that consequently the changes may be occasioned by unknown factors. Unfortunately in the case of the data from groups 5 to 8, where there are two records from the same individuals to be compared, the individuals are not good samples of the general male population, being college seniors or graduate students in groups 6–8 and high-school juniors in group 5.[7]

The most useful data for our purposes are the 15-year-old group from the original interest-maturity scale and the four age groups based upon the census. These constitute good samples of the male population at ages 15, 25, 35, 45, and 55. Group 3 is also a good sample of eight occupations at the four age levels of 25, 35, 45, and 55 years, but the eight occupations are more typical of professional men than of the average man. Group 2, composed of fathers and sons, is representative of the same social strata, but the sons have had more education than their fathers (average grades of 16.2 and 12.8, respectively).

Results.—Figure 15 records the average percentage of liking to be an aviator—item No. 14 on the *Vocational Interest Blank.* The average percentage of each group is indicated on the figure: lines connect those averages that are related. Thus line A connects the 15-year-old and 55-year-old groups upon which the old IM scale is based. Line B connects four samples of the general population at ages 25, 35, 45, and 55 years, etc.

Figures 15 and 16 typify straight-line changes in likes between 15 and 55 years of age. Here the line connecting the 15- and 55-year groups used as criteria for our original interest-maturity scale represents quite well all the data from our 5,406 records. Figure 17, on the other hand, indicates that liking to be an advertising man does not increase steadily from age 15 to 55 years but

[7] The 109 who reported their schooling on the second test average grade 15.4. Of these, 68 finished college and 28 reported some graduate work. If the 53 who failed to report their schooling did so because they had gone no farther than graduation from high school, the entire group would have averaged grade 14.3. An education extending to between two and three years in college is distinctly above the average of the general population.

that instead there is a very pronounced increase in liking it from 15 to 25 years and then a slow but steady decrease in liking it up to 55 years of age.

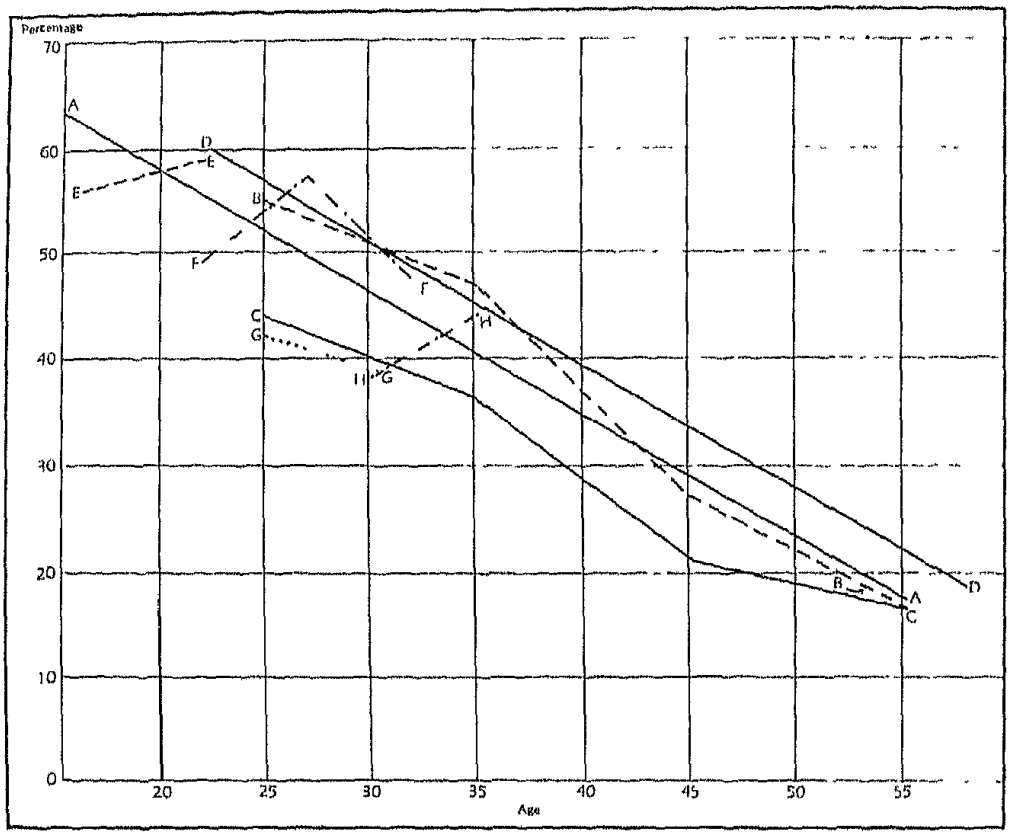


FIG. 15.—Mean percentage of liking to be an aviator of various groups of men at ages 15 to 58 years. Key letters signify as follows:

A. Criterion groups of 15.5- and 55-years of age for original IM scale. The 15-year group is a good sampling of that age.

B. Good sample based on census of 25, 35, 45, and 55 years of age.

C. Representatives of eight occupations at ages 25, 35, 45, and 55 years of age.

D. Fathers and sons.

E. Two tests of the same high-school juniors, ages 16.5 and 22.5 years.

F. Three tests of the same college seniors, ages 22.4, 27.4 and 32.4 years.

G. Two tests of the same graduate students, ages 25 and 30 years.

H. Two tests of the same graduate students, ages 30 and 35 years.

The original IM scale is based upon the relationship in line A between 15- and 55-year old men. The revised 15–25 IM scale is based upon the 15-year group of A and the 25-year group of B. The revised 25–55 IM scale is based upon the 25- and 55-year groups in B. The fourth IM scale is based upon the 25- and 55-year groups of C.

Similar diagrams have been drawn for the first ten items in each of the eight parts of the *Vocational Interest Blank*. Thirty-eight per cent of the 80 diagrams may be classified as similar to Figures 15 and 16, 46 per cent as similar to Figure 17, and 16 per cent as not similar to either. Figure 18 is one example of this third group. The straight line drawn from 15 to 55 years (A) does not represent our census groups who like tennis much less than our other groups, nor does it represent our high-school and college groups and the group composed of eight occupations who like tennis more at 23 to 30 years than they do earlier or later.

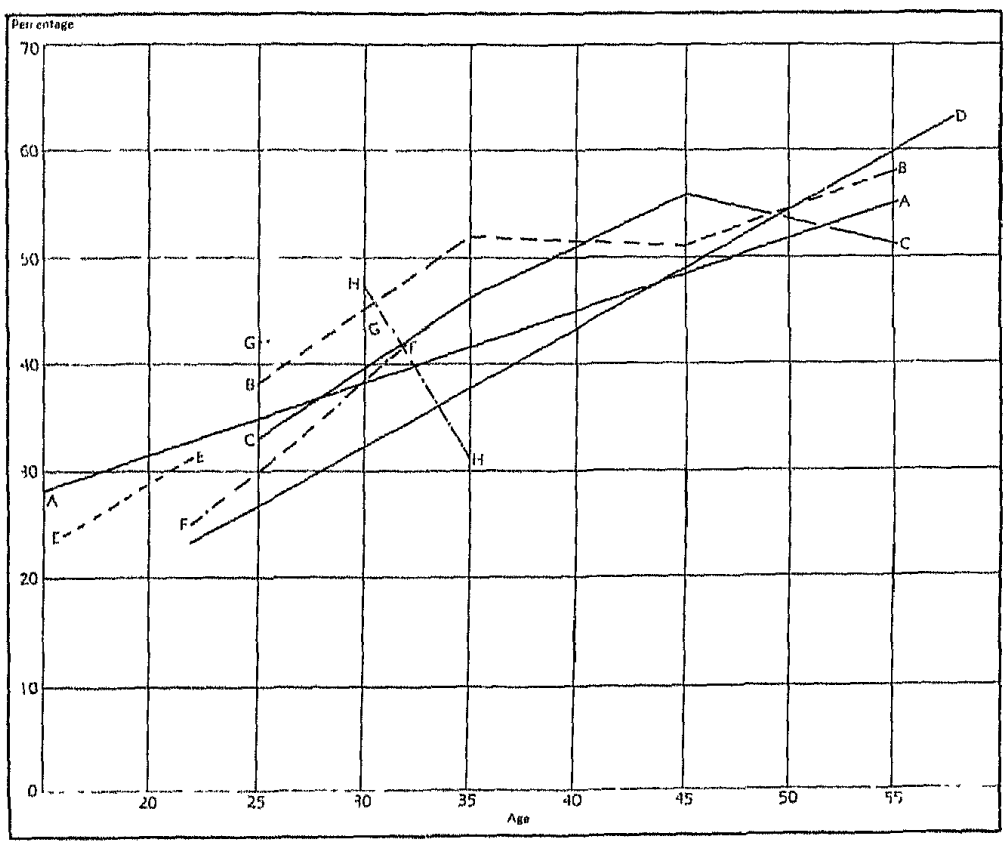


FIG. 16.—Mean percentage of liking to raise flowers and vegetables of various groups of men, ages 15 to 58 years. See Figure 15 for explanation of graphs.

Evidently any straight-line relationship based on interests of 15- and 55-year-old men will represent the interests of intermediate age groups fairly well with 40 to 45 per cent of the items but will not do so for the remainder of the items. In the latter case

either a curve or two or more lines are needed to represent the interests of the several age groups. As there is no convenient way of constructing an interest scale to fit a curvilinear relationship, we are forced to adopt the alternative of setting up two straight-line relationships, one extending from 15 to about 25 years of age and the other extending from 25 to 55 years of age. Two such lines will represent fairly well nearly all the 80 items analyzed. In cases such as Figure 18, two lines will fit better than one line the data based on either the census or on the high-school and college students and professional men but not both. The discrepancy here is not one of fitting one or two lines to the data but involves differences in amounts of interests of two different groups of men.

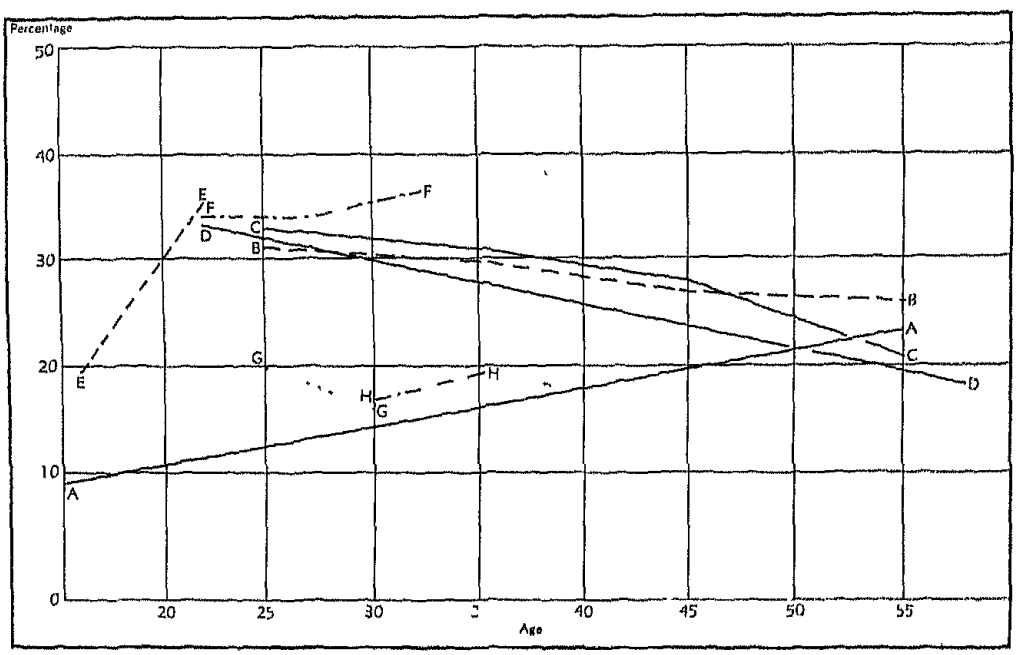


FIG. 17.—Mean percentage of liking to be an advertising man for various groups of men, aged 15 to 58 years. See Figure 15 for explanation of graphs.

Summary.—Liking for approximately two-fifths of the items increases or decreases in a straight line from 15 to 55 years of age; liking for two-fifths of the items increases (or decreases) from 15 to 25 years of age and then decreases (or increases) from 25 to 55 years; and liking for the remaining items differs with different groups of men.

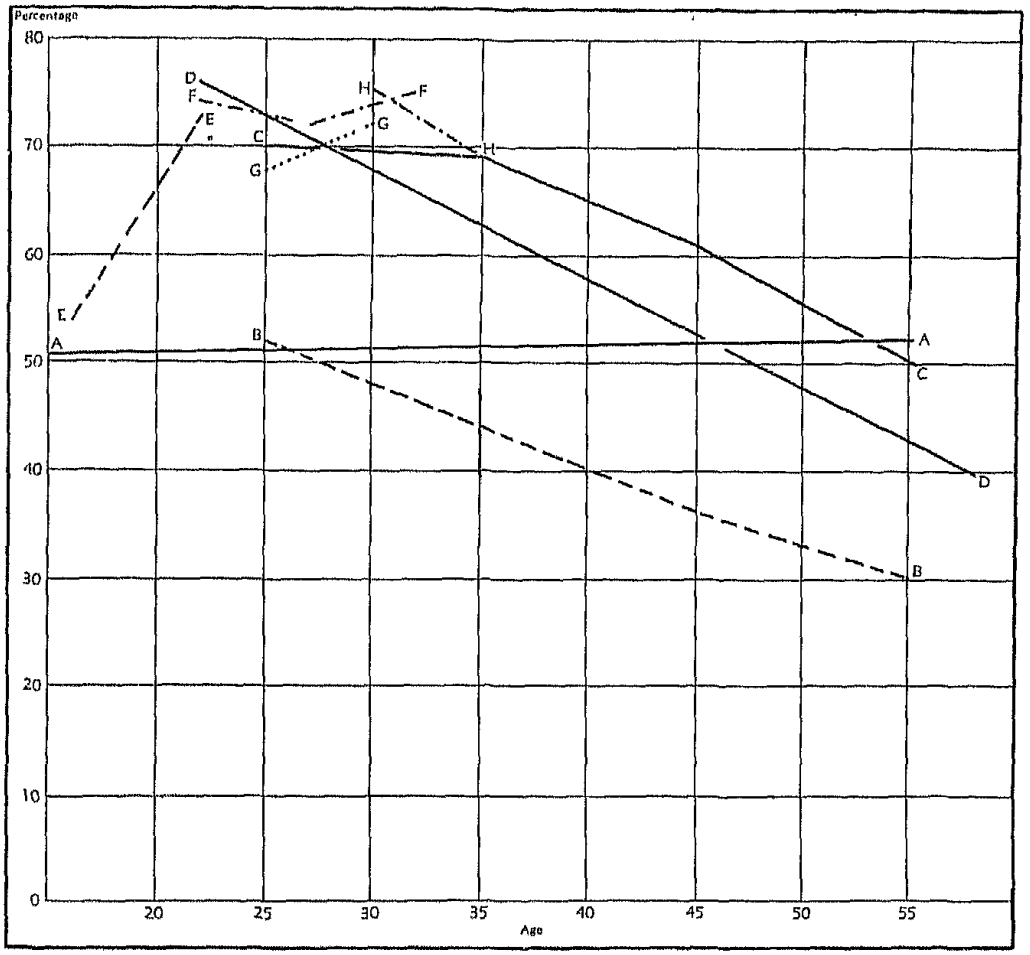


FIG. 18.—Mean percentage of liking to play tennis of various groups of men at ages 15 to 58 years. See Figure 15 for explanation of graphs.

REVISED INTEREST-MATURITY SCALES

Two new interest-maturity scales were devised in the light of the foregoing results—the first contrasting the interests of 15-year-old and 25-year-old men, the second contrasting the interests of 25- and 55-year-old men.

It was deemed worth while to determine whether changes in interests with age of men representing the higher socio-economic levels were comparable with the changes to be found among men in general. In order to accomplish this a third *supplementary* scale was constructed contrasting the interests of men approximately 25 and 55 years old, representing the eight occupations: engineer, lawyer, life insurance salesman, minister, physician,

schoolman, writer, and Y.M.C.A. secretary. The data for each of these eight occupations were reduced to percentages and the eight percentages averaged so that the eight occupations are equally represented at the two age levels. The 25-age group is composed of 604 men between 20 and 29 years of age (average 25.9 years) and the 55-age group is composed of 396 men between the ages of 50 and 55 years (average 53.6 years).[8]

Criterion groups for the two new IM scales.—Three criterion groups were used in constructing the two new interest-maturity scales, representative of men in the United States at the ages of 15, 25, and 55 years. The 15-year-old group is the same as that used in the original interest-maturity scale, referred to above. The 25- and 55-year-old groups are described on page 715. They purport to be good samples of men in the United States within the age ranges of 23 to 27 and 50 to 59. The blanks are drawn from our 1,000-men criterion group described in Table 186 (p. 704). The 25-year-old group averages completion of 11.0 grades (three years of high school), with a range from 5th to 20th grade, and with 28 per cent having had no high-school work. The 55-year-old group averages completion of 9.5 grades—1.5 years less than the 25-year-old group. Fifty per cent of the 55-year-old group have had no high-school work.

Groups scored on four IM scales.—The groups scored on the four scales are much the same as those listed above with several omissions and one addition, namely:

1. The 15-year-old sampling of 433 cases
2. The census sampling of 894 cases[9] ranging from 18 to 57 years of age
3. The high-school junior group of 144 cases, tested twice, six years apart
4. The college freshmen group of 255 cases, tested twice, a year apart
5. The college senior group of 136 cases, tested thrice, five years apart

[8] Detailed description of these two criterion groups is given in Table 1 of the writer's *Change of Interests with Age* (Stanford University Press, 1931).

[9] Of the thousand blanks 106 were at the time "lost" in the files.

6. The graduate students group of 219 cases, tested twice, five years apart

All told, 2,971 blanks were used.

Subsequently three additional sets of data were scored on the 15–25 IM scale, namely, 444 high-school juniors, 174 college freshmen retested nine years later, and 1,412 blanks going through the office for scoring, ranging in age from 15 to 25 years.

Intercorrelations of four IM scales.—The two interest-maturity scales based on 25- and 55-year-old groups correlate .80 with each other. Evidently the changes in interests during these thirty years are approximately the same whether measured by a sample of men in general or by representatives of eight specific occupations.

The revised interest-maturity scale based on 15- and 25-year-old men correlates .74 with the original scale based on 15- and 55-year-old men. This means that the major change in interests between 15 and 55 years occurs between 15 and 25 years. This fact is well substantiated by the data presented below.

The interest-maturity scale based on 15- and 25-year-old men correlates —.41 with the 25- and 55-year-old scale. This means that the changes in interest with age between 15 and 25 years are reversed to some extent during the next thirty years. This fact is also substantiated by additional data presented below.

The correlation of .03 between the original interest-maturity scale (15 to 55 years) and the new scale based on 25- and 55-year-old men indicates that the old scale did not properly measure changes in interest between 25 and 55 years of age.

THE REVISED 15–25-YEAR IM SCALE

The scores of 5,000 males on the revised 15–25-year IM scale are given in Table 66. The data from the census group in the first column of the table should be accepted as the most significant of all if the IM scale is to represent men in the United States, since they purport to be a sample of the general male population. Unfortunately there are not enough cases to give a smooth curve: see the wide fluctuations in age averages in the table. These data are shown graphically by Curve A in Figure 19—the curve having

TABLE

RECORDS OF 15–25-YEAR IM MEAN STANDARD SCORES

Ages	Census Group		11th Grade				College Freshmen			
			444 Cases		1st and 2d Tests		1st and 3d Tests		2d Test	
	N	M	N	M	N	M	N	M	N	M
15.0–15.9	433	38.9	...	....	36	43.3	...	....	..	....
16	...	....	178	43.2	73	42.9	6	50.7	..	....
17	...	....	146	45.1	35	45.4	68	49.5	6	48.0
18	15	48.1	91	43.5	..	....	115	50.4	68	50.3
19	14	50.3	29	46.8	..	....	50	50.6	115	51.6
20	21	49.6	...	....	..	....	10	51.1	50	52.0
21	25	51.4	...	....	36	50.3	4	51.8	10	50.8
22	61	54.7	...	....	73	52.9	1	52.4	4	50.5
23	36	52.0	...	....	35	53.1	...	....	1	48.0
24	31	55.6	...	....	..	....	...	....	..	....
25	24	55.1	...	....	..	....	4	53.5	..	....
26	31	51.4	...	....	..	....	27	53.0	..	....
27	56	52.5	...	....	..	....	83	53.5	..	....
28	33	52.4	...	....	..	....	46	52.7	..	....
29	11	47.9	...	....	..	....	8	56.6	1	61.9
30	28	54.8	...	....	..	....	3	58.0	..	....
31	21	52.0	...	....	..	....	1	56.8	..	....
32	41	52.5	...	....	..	....	1	62.4	..	....
33	17	50.4	...	....	..	....	1	62.4	..	....
34	13	51.9	...	....	..	....	...	....	..	....
35	20	54.5	...	....	..	....	...	....	..	....
36	27	51.6	...	....	..	....	...	....	..	....
37	47	55.6	...	....	..	....	...	....	..	....
40	109	53.5	...	....	..	....	...	....	..	....
45	80	53.5	...	....	..	....	...	....	..	....
50	76	54.0	...	....	..	....	...	....	..	....
55 ..	57	51.2	...	....	..	....	...	....	..	....
Total	1,327	....	444	....	288	....	428	....	255	....

been smoothed by a "moving average" procedure from 19 years upward. Data from the 15-year group and the high-school and college groups but not the census group are combined in Curve B. This curve is appreciably higher than the first curve at ages 16 to 18 years and lower at ages 20 to 25 years.[10] No plausible explan-

[10] The critical ratios between the two curves are greater than 3 for ages 15 to 17, about 2.5 at age 18, and only 1.1 at age 19, and become insignificant for other ages up to 28 years.

66

AT AGES 15 TO 55 YEARS OF VARIOUS GROUPS OF MEN

College Seniors		Graduate Students				"Through Office"		All Data		Ages
1st, 2d, 3d Tests		1st Test		2d Test						
N	M	N	M	N	M	N	M	N	M	
..	....	..	....	..	....	21	45.8	490	39.5	.....15.0-15.9
..	....	..	....	..	....	56	50.5	313	44.6	16
..	....	..	....	..	....	200	50.2	455	48.1	17
..	....	..	....	..	....	200	50.9	489	49.3	18
..	....	..	....	..	....	200	52.0	408	51.3	19
28	50.7	..	....	..	....	200	51.8	309	51.6	20
52	51.2	15	53.4	..	....	200	52.5	342	52.0	21
40	51.7	29	51.0	..	....	136	53.1	344	53.0	22
16	50.7	45	52.2	..	....	90	54.5	223	53.1	23
..	....	37	51.9	..	....	68	54.7	136	54.2	24
28	53.2	24	52.2	..	....	41	53.9	121	53.6	25
52	51.5	15	51.8	15	53.4	...	....	140	52.0	26
40	53.1	11	52.5	29	53.5	...	....	219	53.1	27
16	53.7	9	50.5	43	53.1	...	....	147	52.7	28
..	....	6	52.4	40	51.9	...	....	66	52.0	29
28	53.8	5	54.3	20	53.6	...	....	84	54.3	30
52	53.1	8	52.7	17	51.0	...	....	99	52.5	31
40	54.1	3	52.3	11	50.6	...	....	96	53.1	32
16	54.8	7	55.1	11	50.4	...	....	52	53.5	33
..	....	2	55.7	4	50.7	...	....	19	52.0	34
..	....	2	58.2	8	52.9	...	....	30	54.3	35
..	....	1	48.7	4	51.3	...	....	32	51.5	36
..	....	..	....	5	54.1	...	....	52	55.5	37
..	....	..	....	12	54.5	...	....	121	53.6	40
..	....	..	....	..	....	...	....	80	53.5	45
..	....	..	....	..	....	...	....	76	54.0	50
..	....	..	....	..	....	...	....	57	51.2	55
408	....	219	....	219	....	1,412	....	5,000	....	.....Total

ation is at hand for these differences in the two curves. The writer's guess is that if better samples of males at the various ages were available it would be found that both curves would be quite similar, rising to about 53 standard score at age 25 and continuing at that level until age 50. Roughly speaking, one-third of the change in interests is between 15.5 and 16.5 years, one-third between 16.5 and 18.5 years, and one-third between 18.5 and 25 years.

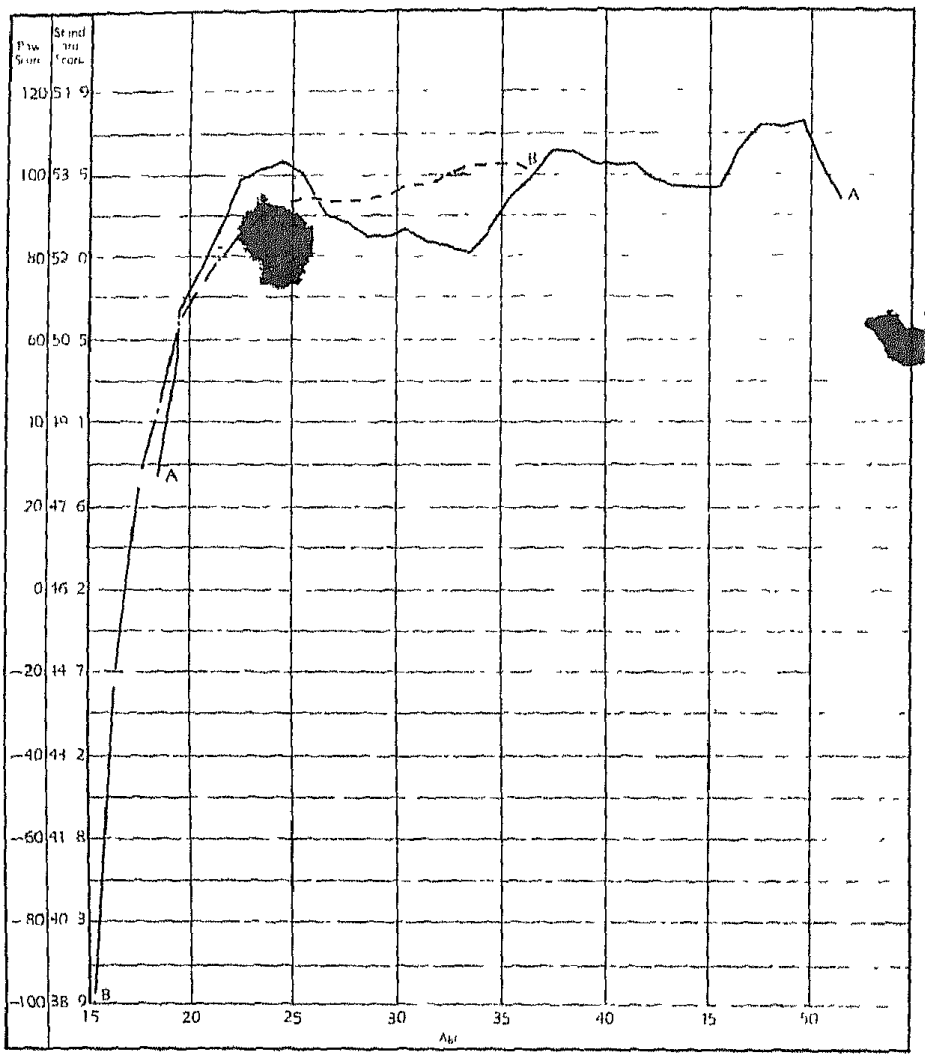


FIG. 19.—15- to 25-year revised IM scores according to age of (*A*) 894 cases representative of the male population, aged 18 to 50, and (*B*) 4,106 students. (Both curves are smoothed beginning at 19 years.)

Reliability and permanence.—The reliability of the 15–25-year IM scale is .932. Only two occupational scales have higher reliability (see Table 4, p. 78).

The permanence of interests as measured on this scale by correlation is the lowest for any scale, except C.P.A. Test-retest correlations for four groups of students and for varying intervals from one to ten years are reported in Table 67. Correlations on

other scales are reported in Table 95 (p. 360). For example, college freshmen for an interval of one year average .80 on the other scales instead of .76 on the IM scale; college seniors for an interval of five years average .74 instead of .65; and for an interval of ten years they average .72 instead of .60, as here.

TABLE 67

TEST–RETEST CORRELATIONS OF 15–25-YEAR IM SCALE FOR VARIOUS AGES AND INTERVALS OF TIME

N	School Grade	Ages	Interval	Correlation
144	High-school juniors.....	15–17 years vs. 21–23 years	6 years	.46
254	College freshmen.....	16–21 years vs. 17–22 years	1 year	.76
171	College freshmen.....	16–21 years vs. 25–30 years	9 years	.40
189	College seniors.....	20–23 years vs. 25–28 years	5 years	.65
161	College seniors.....	20–23 years vs. 30–33 years	10 years	.60
150	Graduate students.....	21–25 years vs. 26–30 years	5 years	.64

Changes in test-retest scores on the IM scale of high-school and college students are given in Tables 195 and 196 (pp. 720–722). The changes agree very well with the corresponding amounts for similar age differences in Figure 19, except for the college seniors, where the test-retest differences are one to two standard scores greater than the figure indicates. All the test-retest differences are statistically significant except for the eight-year interval with college freshmen, where the critical ratio is but 2.5.

Standard scores.—It seemed unwise to base standard scores merely upon the two criterion groups of 433 15-year-old boys and 215 23- to 27-year-old men, as that would provide no representation of ages 16 to 22. Accordingly 171 records from the 1,000 men (census group) for ages 18 to 22 were used, together with 108 records of 16- to 17-year-old high-school boys, making a grand total of 927 cases. In order that each age might be equally well represented, the data for each age were reduced to percentages and the percentages handled as though there were one hundred cases at each age. The resulting distribution of scores ranges from 300 to —400 raw scores (68.1 to 17.0 standard scores).

The mean raw score is 52.54, with standard deviation of 136.97.

In terms of standard scores the changes in interests with age do not seem large, since 15-year-olds have a standard score of 38.9 and 25-year-olds a score of 52.7. This difference has, however, a critical ratio of 52.1, which means, of course, that there is practically no chance that the two averages do not differ. But even with such a difference in means, there is nevertheless 41 per cent overlapping between the two distributions.[11] The average score of college freshmen is 49.9 and that of college sophomores is 50.9—the difference of one standard score has a critical ratio of 1.51. (A difference of two standard scores with populations of 250 may be considered to be statistically significant.)

Percentiles.—Since Curves A and B in Figure 19 differ so little and there occurs no plausible explanation for what differences there are, it has seemed best at this time to base our table of percentiles (Table 68) upon all our data, mingling the records of the well-educated and the less well-educated together. Accordingly the percentiles are based on 4,178 cases which are approximately the same cases as reported in Table 66 for age 15 to 30 years, inclusive.

The very wide range of scores and the great overlapping between age groups suggest that there is little to gain by expressing interest-maturity scores in terms of standard scores. (See averages and sigmas for each age in Table 68.) For example, 5 per cent of 20-year-olds have interest maturity of less than the average 15-year-old and 29 per cent have interest maturity of more than the average 30-year-old. It would seem to be better procedure to express interest maturity in terms of the percentile rating for the given age. Thus an interest-maturity standard score of 44.7 is to be interpreted as the 70 percentile if the male is 15 years old, as the 47 percentile if he is 16 years old, as the 18 percentile if he is 20 years old, and as the 6 percentile if he is 25 years old.

Correlation with age.—The Pearson product-moment correlation between interest maturity and age for the age range 15–30 years is .45, based on 2,152 of the records which are reported in

[11] See p. 110, above, for explanations of overlapping as used here. Since the data are based on our criterion groups the difference in means is probably spuriously high and the percentage of overlapping is spuriously low.

Table 66. As the regression is nonlinear for interest maturity on age, the correlation ratio, etc., was calculated, giving the coefficient of .57. The regression of age on interest maturity is .46. These

TABLE 68

PERCENTILES FOR AGES 15 TO 30 ON REVISED 15–25-YEAR IM SCALE

Raw Score	Standard Score	Ages															
		15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
295	67.7	..	..	..	99	99	99	99	..	..	..	99	99	99	..	..	99
280	66.6	..	..	..	99	99	99	99	99	99	99	98	99	99	99	..	98
265	65.5	..	..	99	99	99	98	99	99	97	99	98	99	99	99	..	98
250	64.4	..	..	99	99	99	97	99	98	96	97	98	97	98	98	..	96
235	63.3	..	..	99	98	98	97	98	96	95	93	96	96	96	98	99	94
220	62.2	..	99	98	96	96	95	95	92	95	89	92	95	94	95	98	93
205	61.1	99	98	97	96	94	93	93	87	91	85	86	92	91	90	95	92
190	60.0	99	97	95	93	91	91	89	84	88	81	84	90	84	84	88	84
175	58.9	98	96	92	89	88	84	84	79	84	74	81	85	81	80	83	78
160	57.8	97	95	89	86	83	80	81	75	77	66	76	80	76	75	80	66
145	56.8	96	92	85	81	78	76	75	70	74	64	66	72	70	70	73	56
130	55.7	94	90	81	77	74	70	69	63	68	56	60	64	62	65	62	49
115	54.6	93	88	77	72	66	62	64	58	59	51	53	59	54	59	59	46
100	53.5	91	82	72	66	60	56	57	54	51	42	50	52	47	54	53	41
85	52.3	89	79	67	60	52	52	50	46	45	35	43	46	43	44	48	38
70	51.3	87	74	62	56	46	47	44	41	36	27	36	40	34	41	39	29
55	50.2	84	68	57	51	40	41	37	33	29	23	29	38	30	34	36	24
40	49.1	82	63	52	45	33	34	32	30	25	18	28	28	26	27	32	24
25	48.0	80	59	48	39	28	29	26	25	19	17	17	25	22	20	26	21
10	46.9	77	55	42	33	23	24	20	21	13	12	13	21	16	18	21	15
—5	45.8	73	51	38	29	20	22	16	16	10	9	9	19	14	16	18	12
—20	44.7	70	47	33	26	16	18	12	13	8	7	6	17	9	16	11	9
—35	43.6	66	42	28	24	15	13	11	10	5	5	5	13	6	8	9	8
—50	42.5	62	39	23	21	11	11	8	7	4	4	3	12	5	7	8	7
—65	41.4	59	35	20	17	9	8	6	5	1	3	3	10	2	4	5	7
—80	40.3	55	33	18	14	8	7	5	4	1	2	2	9	1	2	5	7
—95	39.2	51	29	15	12	6	6	4	3	1	2	2	8	1	2	5	6
—110	38.1	46	26	12	12	5	4	3	2	1	2	2	4	1	2	5	2
—125	37.0	42	23	10	9	3	3	3	2	1	1	2	4	1	1	3	2
—140	35.9	38	20	8	8	2	3	1	2	1	1	1	2	1	1	3	2
—155	34.8	35	17	7	6	1	2	1	1	1	1	1	1	1	1	3	1
—170	33.8	31	13	5	5	1	1	1	1	1	1	1	1	1	1	3	1
—185	32.7	28	12	4	4	1	1	1	1	..	1	1	1	1	1	2	1
—200	31.6	26	9	3	4	1	..	1	1	..	1	..	1	1	1	2	1
—215	30.5	22	6	2	3	1	..	1	1	..	1	..	1	1	1	2	1
—230	29.4	19	5	2	2	1	..	1	..	..	1	..	1	1	1	2	1
—245	28.3	15	4	2	1	1	..	1	..	..	1	..	1	1	1	2	1
—260	27.2	12	4	2	1	1	..	..	..	..	1	..	..	..	1	2	1
—275	26.1	11	3	1	1	..	..	..	..	..	..	..	..	..	1	2	1
—290	25.0	8	2	1	1	..	..	..	..	..	..	..	..	..	..	2	1
—305	23.9	6	2	1	1	..	..	..	..	..	..	..	..	..	..	..	..
—320	22.8	5	2	1	1	..	..	..	..	..	..	..	..	..	..	..	..
—335	21.7	3	1	1	1	..	..	..	..	..	..	..	..	..	..	..	..
—350	20.6	2	1	1	1	..	..	..	..	..	..	..	..	..	..	..	..
—365	19.5	1	1	1	1	..	..	..	..	..	..	..	..	..	..	.	..
—380	18.4	1	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..
—395	17.3	1	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..
N =		454	313	455	485	407	315	341	311	222	136	118	138	185	147	66	85
Standard-Score Av.		39.2	44.6	48.0	49.3	51.3	51.6	52.0	52.8	53.2	54.4	53.6	52.0	53.2	52.8	52.0	54.0
Sigma		10.0	9.1	8.2	8.4	6.9	7.1	6.7	6.9	5.9	6.5	6.3	7.4	6.3	6.7	7.0	7.4

relatively low correlations indicate that one or more factors besides age affect IM scores. We shall see below that occupational interests are very distinctly associated with IM.

Education and IM.—Despite IM records of over four thousand men of varying education and age, it is not yet clear just what the relation is between education and IM. Certain facts throw light on the situation.

In a school grade the youngest students have higher intelligence than the average and the oldest students have correspondingly lower intelligence. In other words, students advanced beyond their normal grade are more intelligent, retarded students are less intelligent. Comparison of the younger students with the remainder of the group discloses no such tendency with scores on the IM scale. In nine out of ten comparisons the "youngest" students average lower in IM than the remainder.[12] Similarly, when the "oldest" students are contrasted with the remainder, they score higher in IM in seven out of nine comparisons. The differences are slight: the "youngest" average .8 standard score lower than the remainder, and the "oldest" average 2.0 standard score higher than the remainder. Chronological age, evidently, offsets scholastic achievement as far as IM scores are concerned. This is not unexpected, since intelligence (*Thorndike Intelligence Examination for High School Graduates*) and IM correlate —.16.

Analysis of the records of 1,315 blanks of high-school and college students going through the office for scoring shows that the older boys in a given grade average 2.9 per cent higher IM score than the younger boys. At the same time the more advanced students of a given grade average 4.2 per cent higher than the less advanced students. Here the conclusion is the opposite of that found above.

In both of these sets of data the majority of men were above 18.5 years of age, an age range where there are only relatively slight changes in IM score. When only 15-year-old boys are considered and IM score is compared with scholastic achievement, we

[12] Although the youngest high-school juniors and college freshmen and sophomores do not score as high in IM as older men in the same grade, yet they score proportionately higher in comparison with the norms for their age (see Fig. 19) than do the remainder of their class.

have the data given in Table 69. These data show that 15-year-old boys in the seventh grade average 36 IM score, those in the junior class in high school average 44 IM, and those in the senior year, 48.2 IM. Evidently there is here definite increase in IM score with educational attainment.

TABLE 69

RELATION OF IM AND SCHOLASTIC ACHIEVEMENT AMONG 433 15-YEAR-OLD BOYS

Grade	N	Mean IM Score	σ
Grammar, seventh	31	36.0[a]	8.9
Grammar, eighth	73	34.4	8.6
Grammar, ninth and High School, first	130	38.7	10.1
High School, second	142	39.9	9.2
High School, third	46	44.0	10.0
High School, fourth	11	48.2	8.7

[a] The low mean scores of the first two groups are significantly lower than the higher mean scores of the last two groups.

It is unfortunate that we do not have the intelligence test scores of these 433 15-year-old boys. Lacking them it is impossible to make any guess as to the relative importance of intelligence and IM in explaining the wide range of scholastic achievement. Since the two do not correlate, it will be interesting to discover how they can both be associated, as it would appear that they are, with scholastic achievement. The standard deviations for the subgroups in Table 69 are large, approximating the sigma for males ranging from 15 to 30 years of age. Consequently there is great overlapping in IM scores between the subgroups which might explain the results on the basis that some boys are well advanced educationally because of intelligence and some because of interest maturity.

Leadership and IM.—Hunter and Jordan[18] report that leaders among college students were found to score significantly higher on the unrevised IM scale than nonleaders: "leaders were sixteen per cent and outstanding leaders twenty-five per cent more mature in interests than non-leaders even though the latter were actually from

[18] E. C. Hunter and A. M. Jordan, "An Analysis of Qualities Associated with Leadership among College Students," *Journal of Educational Psychology* (1939), **30**, 507.

five to ten months older than leaders." The original IM scale, as has already been pointed out, measured not only changes in interests associated with chronological age but also changes associated with increasing educational attainment. The revised IM scale is apparently much less influenced by educational achievement. Scores on it may not reflect leadership as found by Hunter and Jordan. The subject should be investigated.

IM AND OCCUPATIONAL INTERESTS

Two different but somewhat related issues concern us here. First, do men in some occupations exhibit immature interests in that they score relatively low on the IM scale, and is the reverse true of men in other occupations? Second, do adolescent boys score low on certain occupations and the reverse on other occupations? If so, is there any relationship between such low and high occupational scores and IM scores?

IM scores of adult men.—The answer to the first question is yes, i.e., men in certain occupations score low on the IM scale and in other occupations they score high. The mean scores of our criterion groups on the IM scale are given in the first column of Table 70. Table 87 (p. 324) gives the same data with the occupations listed by occupational groups. These data show that occupational Group V scores highest on IM (56.5 to 58.7) and Groups III, VII, VIII, and half of Group IV and Group IX score 53 to 55.4. Group I, except artist, and Group II score in the neighborhood of 50; and author-journalist and artist score lowest of all, i.e., 47.5 and 46.2, respectively.

The range of mean IM scores for occupations is 12.5 standard scores (from 58.7 for Y.M.C.A. secretary to 46.2 for artist). This range is only slightly less than that for different ages, i.e., 15.3 (from 54.2 at age 50 to 38.9 at age 15). Differences in interests among occupations affect IM score nearly as much as differences in chronological age.[14]

[14] This phenomenon is not to be explained, even in part, on the basis of the age of the occupational criterion groups, for Group V with the highest IM mean score averages 39.5 years of age and Groups I and II with the lowest IM score average 42.0 years of age.

TABLE 70

Relationship between IM and Occupational Interests*

Occupation	Mean Score of Criterion Groups on IM Scale	Correlation between IM and Occupation	Differences[a] in Mean Scores on Occupational Scales					
			15.5- and 25-Year Census Groups	16.5- and 22.5-Year High School	18 7- and 22.7-Year College Freshmen	22.4- and 32.4-Year College Seniors	25- and 35-Year Census Groups	35- and 45-Year Census Groups
Y.M.C.A. secretary	58.7[b]	.84	13.1	9.1	1.5	.9	—3.2	1.3
Personnel manager	56.5[b]	.75	13.6	12.6	6.8	4.4	—3.1	—3.4
Social science teacher	57.0	.75	11.6	9.6	1.7	2.0	—5 7	3.1
Y.M.C.A. physical director	56.1	.67	6.5	6.3	—0.3	.7	—2.9	—1.7
City school superintendent	56.5	.63	12.4	8.8	3.4	3.5	—4.5	2.7
Office worker	54.6	.61	9.4	5.5	—1.9	—.8	—2.6	—1.1
Minister	57.3	.54	10.4	7.9	3.0	2.1	—3.6	1.7
Accountant	55.4	.52	11.8	6.8	3.1	3.0	—3.5	—.8
Mathematics-science teacher	55.1	.30	4.6	6.2	0.8	2.6	—2.8	1.2
Policeman	53.8	.27	—.5	0.6	—2.4	—.1	.6	—1.2
Life insurance salesman	53.8	.27	3.3	—.03	—2.4	—2.8	1.1	—3.8
Sales manager	54.3	.21	4.7	1.2	0.4	0	1.2	—3.7
Banker	53.4	.17	1.2	—0.2	—1.7	0	1.8	.4
C.P.A.	53.8	.09	4.0	3.0	4.3	3.1	—2.8	—3.3
Forest service	52.5	.08	1.9	2.3	1.0	2.9	—1.1	3.7
Musician	52.8	.04	—3.5	2.4	—2.3	—1.3	—3.3	—.4
Printer	53.4[b]	.03	—1.7	2.1	—0.7	1.9	—2.5	.8
Purchasing agent	53.9[b]	.03	2.7	0.8	0.3	.5	.3	—2.0
Production manager	53.0	.01	2.8	2.8	3.2	3.7	2.1	—1.9
Realtor	51.9	—.02	—2.2	—2.6	—2.8	—2.6	2.3	—3.3
Advertising man	52.8	—.08	—1.1	0.4	1.7	—.3	—1.2	—1.3
Psychologist	51.6	—.14	—2.3	4.0	5.6	4.0	—3.4	1.7
Carpenter	51.3	—.14	—7.1	1.0	—2.4	.9	4.5	.3
Lawyer	52.4	—.15	—2.0	—1.4	—0.5	—.9	—2.4	—.9
Farmer	50.2	—.29	—8.0	—4.8	—3.5	—.7	.6	6.1
President	52.8	—.32	—1.2	—2.6	3.2	2.2	3.0	—1.2
Chemist	50.6	—.38	—7.3	—1.7	3.3	3.5	—.2	—.3
Dentist	51.8	—.39	—7.8	—3.2	—2.0	.5	2.1	—.6
Engineer	51.6	—.44	—5.6	—3.9	1.9	2.5	1.1	—.6
Journalist	47.5	—.45	—6.9	—3.4	0.7	—.7	—.8	.1
Architect	50.7	—.46	—7.1	—3.1	2.4	1.4	.6	.1
Mathematician	49.4	—.47	—8.0	—3.5	2.0	1.8	—.8	3.1
Physician	49.7[b]	—.51	—10.2	—5.1	—0.3	.4	1.6	—.3
Artist	46.2[b]	—.53	—10.1	—4.7	0.5	—.6	.4	.4
Average change	...	..	6.1	3.9	2.2	1.9	2.2	1.7
Net change	...	..	0.6	1.6	0.8	1.1	—.8	—.2

* Mean scores given in Tables 195 and 196, pp. 720–22.

[a] Critical ratios for over half of these differences are given in Table 96, p. 363.

[b] The standard deviation of Y.M.C.A. secretary is 5.3, of personnel manager is 5.4, of printer is 6.5, of purchasing agent is 7.2, of physician is 7.1, and of artist is 6.8. Mean scores and σ based on samples of 100 in each case. The difference in score of Y.M.C.A. secretary and printer has a critical ratio of 6.3.

The relationship between occupations scored on the IM scale and age groups similarly scored are given in Table 71. In terms of this scale Occupational Group V and the four occupations of accountant, officeman, mathematics-science teacher, and sales manager average higher than the mean score of any age group, while Occupational Groups I and II have mean scores approximating that of 19-year-olds and artists and journalists have such low scores that they might be classified with 17-year-old boys. These relationships are not to be unduly stressed; they are given in order to emphasize that adult men in some occupations score quite low on the IM scale, exhibiting thereby interests characteristic of adolescent boys. This being the case, in interpreting IM scores of young men one must take into account their occupational-interest scores. A future artist, for example, should have a much lower IM score than a future minister.

TABLE 71

RELATIONSHIP OF IM SCORES OBTAINED BY MEN FROM 15.5 TO 24 YEARS OF AGE AND MEAN IM SCORES OF ADULTS IN 34 OCCUPATIONS

IM Score	Age	Occupations with Corresponding IM Mean Scores
39	15.5	
46	16	Artist, journalist
49.5	17	Physician, mathematician
50.5	18	Architect, chemist
51	19	
51.5	20	Dentist, psychologist, engineer, carpenter
52	21	Realtor
52.5 52.5	22} 23}	Forest service, musician, lawyer
53	24	Advertising man, president, production manager, printer, policeman, C.P.A., purchasing agent, banker, life insurance salesman
54–55	...	Mathematics-science teacher, office man, sales manager, accountant
56–58	...	Personnel manager, city school superintendent, Y.M.C.A. physical director, social science teacher, minister, Y.M.C.A. secretary

Two other ways of expressing the relationship between occupational interests and interest maturity are given in Table 70. The second column of the table gives the correlations between oc-

cupational scores and IM scores from the blanks of 285 college seniors.[15] Practically the same conclusions are to be drawn from these correlations as from the mean scores of occupations on the IM scale (the rank-order correlation of data in columns one and two is .95 (see Table 72). Interest maturity can also be expressed by the changes in occupational-interest scores between 15 and 25 years. Such changes are given in column three of the table. These data correlate about .95 with the preceding two columns of data. It is to be expected that these data would correlate highly with the data in column one, since the IM scale is based on the differences in interests of these two age groups.

TABLE 72

RELATIONSHIP BETWEEN IM AND CHANGES IN INTERESTS OF CERTAIN GROUPS OF MEN

(Rank-Order Correlations of Columns in Table 70)

Item	Correlation between IM Scores and Occupational Scores	Differences in Mean Scores					
		15.5- and 25-Year Census Groups	16.5- and 22.5-Year High School	18.7- and 27.7-Year Freshmen	22.4- and 32.4-Year Seniors	25- and 35-Year Census	35- and 45-Year Census
	2	3	4	5	6	7	8
Mean score of occupational-criterion groups on IM scale	.95	.96	.88	.22	.25	—.57	—.13
Correlation between scores on IM and occupational scales	...	.94	.90	.08	.19	—.59	...
Differences in mean scores of:							
15.5- and 25-year census groups	...	...	.88	.32	.35	—.57	...
16.5- and 22.5-year high school	...	...	...	.39	.48	...	...
18.7- and 27.7-year college freshmen	...	...	...	...	.84	...	...
22.4- and 32.4-year college seniors	...	...	...	...	...	.34	...
25- and 35-year census groups	...	...	...	...	...	...	—.30
35- and 45-year census groups	...	...	...	...	...	...	...

[15] These correlations are plotted in Figures 23 to 26 (pp. 328–29). As pointed out in the two preceding chapters, these figures aid materially in understanding how occupations are distributed in terms of IM and in relationship to MF and OL.

The differences in mean scores of 16.5-year-old high-school boys retested six years later, when they were 22.5 years old, correlate almost as well with the first two columns of data (coefficients of .88 and .90; (see Table 72) as do the differences in mean scores of 15.5- and 25-year-old men upon which the IM scale was based. The test-retest data of high-school boys provide additional proof of the validity of the IM scale. It is to be noted, however, that the average of the 34 differences in occupational scores of the 16.5–22.5 group is 3.9, whereas the average of the differences in scores of the 15.5–25 group is 6.1. The former is only about two-thirds of the latter, which is in agreement with the statement previously made that one-third of the change in interests between 15.5 and 25 years is to be found in the one-year range from 15.5 to 16.5 years.

Differences in mean scores of several other groups are given in Table 70, which yield much lower correlations. College freshmen, for example, tested at 18.7 and 27.7 years correlate .89 (Table 73); but the differences in the mean scores of test and retest correlate only .39 with differences in the mean scores of

TABLE 73

RELATIONSHIP BETWEEN IM AND MEAN SCORES AND DIFFERENCES IN MEAN SCORES OF CERTAIN GROUPS OF MEN*

Item	15.5- and 25.0-Year Census Groups	16.5- and 22.5-Year High-School Groups	18.7- and 27.7-Year College Freshmen	22.4- and 32.4-Year College Seniors	25- and 35-Year Census Groups	35- and 45-Year Census Groups
Correlation between scores on IM and occupational scales and occupational mean scores, first test...	—.52	—.47	—.12	—.15	.36	.14
Second test.....	.36	.25	—.10	—.11	.14	.11
Differences in mean scores, two tests.	.94	.90	.08	.19	—.59	—.13
First test vs. second test.....	.57	.66	.89	.92	.95	.95

* Figures are rank-order correlations of 34 variables. Mean scores are given in Tables 195 and 196, pp. 720–22. Differences in mean scores are given in Table 70.

high-school boys tested at 16.5 and 22.5 years. The explanation is twofold: two-thirds of the change in interest between 15 and 25 years occurs before 18.5 years, so that the college freshmen can-

not be expected to exhibit the change in interests that younger boys show. Second, college freshmen are a different sample from the general population—they score high and low on a combination of occupations somewhat different from samples of the general population, and the shifts in their interests are not parallel to those of the latter.

Table 73 gives additional information as to how occupational scores are related to IM at different ages. Correlations between scores on IM and occupational scales (column two of Table 70) are correlated with mean occupational scores of 15.5-year-old boys and of 25-year-old men, for example. The coefficient of —.52 in the first case indicates that young boys score high on occupations correlating negatively with IM and score low on occupations correlating positively with IM. The coefficient of .36 in the second case indicates that the reverse occurs to some degree with 25-year-old men. But the differences in mean scores of the two groups correlate very high (.94) with the data in column 2, as already pointed out. On the other hand, when pairs of older age groups are similarly considered, the coefficients approximate zero, indicating that IM is not associated with mean occupational scores nor with changes in such scores over a period of adult life. The coefficients in the last row of Table 73 show how remarkably stable are mean occupational scores of adult groups, whether between test and retest of the same individuals or between mean scores of two different groups. But this stability becomes less and less as younger groups are considered. Much, but of course not all, of this instability is to be associated with increased experience along various lines and with the changes in interests which develop naturally with age.

Changes in occupational-interest scores with age.—Figures 20 and 21 depict the mean scores of 15-, 25-, 35-, and 45-year-old men on the 34 occupational scales, which are given in Table 195. The curves emphasize two things. First, there is relatively little difference in mean scores on most occupational scales after 25 years of age. Second, on most scales there is either a distinct rise or a fall in score between 15 and 25 years of age—the rise or fall being associated with positive or negative correlation with scores on the IM scale.

Changes in score between 15 and 25 years of age, as shown in Figures 20 and 21, agree very well with data based on test-retest of the same individuals. The few exceptions follow. The depicted curves for banker and life insurance salesman rise slightly, whereas test-retest data show a slight drop. The reverse occurs with advertiser. The curve for journalist drops distinctly, whereas the test-retest data indicate only a slight drop. The most extreme

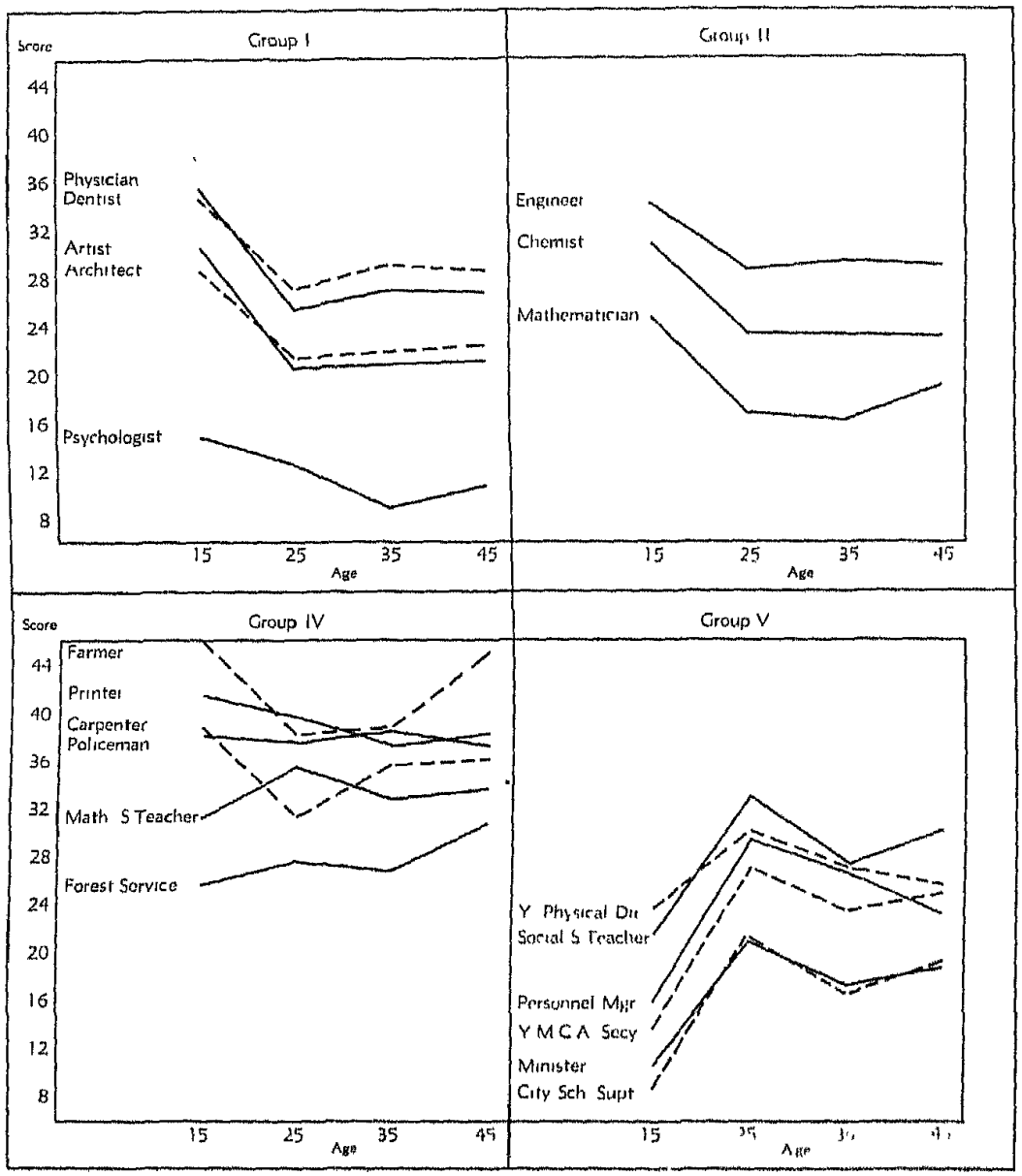


FIG. 20.—Mean occupational-interest scores at ages 15 to 45 years (mean scores given in Table 195, p. 720).

exception is in the case of psychologist, where the printed curve shows a slight drop and the test-retest data give a distinct rise between 15 and 25 years.

The curves also make clear that there is a distinct tendency for all age groups to score relatively high on certain occupations and the reverse on other occupations. It is also evident that the rank-order of occupational scores at 15 years is maintained surpris-

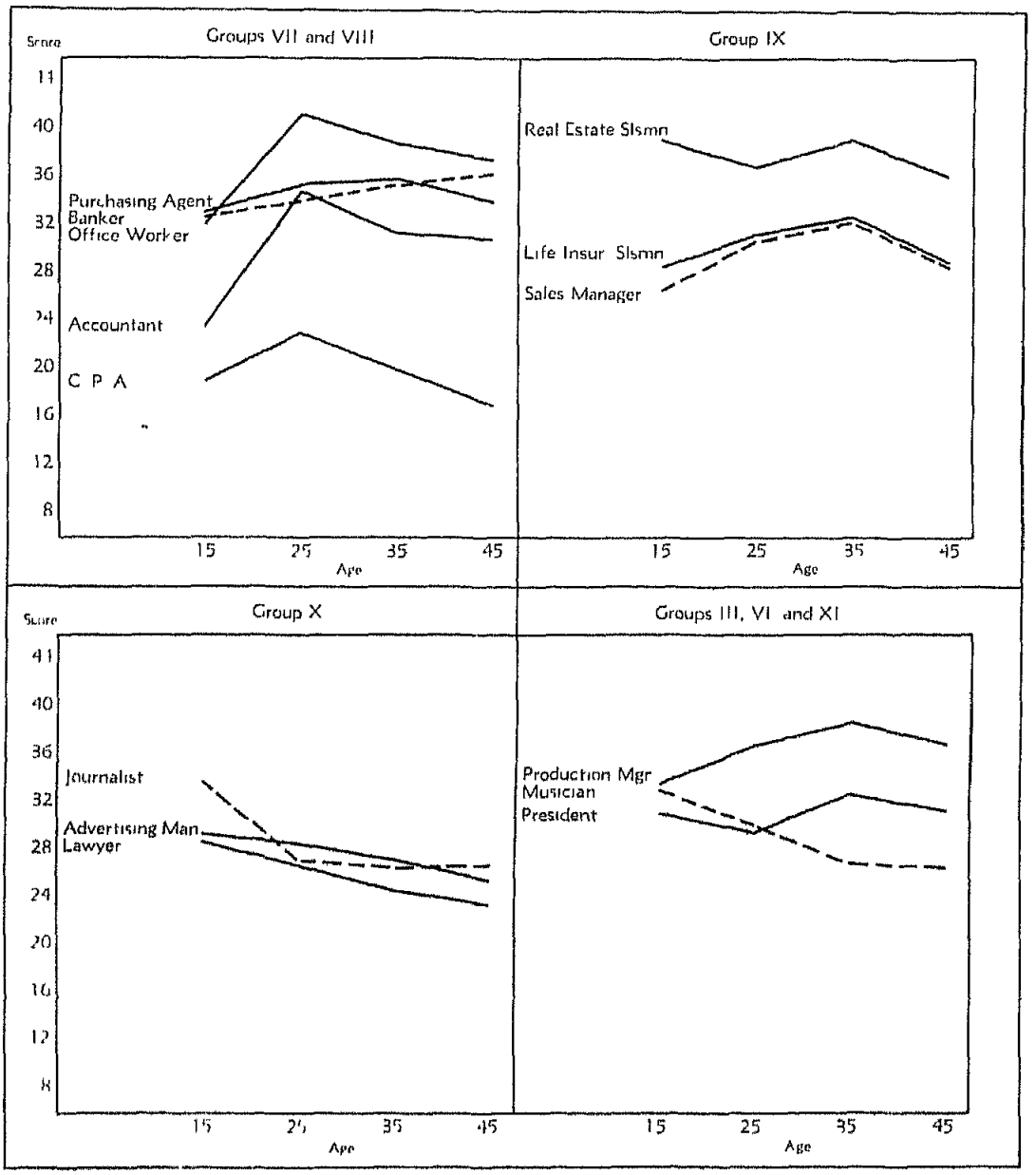


FIG. 21.—Mean occupational-interest scores at ages 15 to 45 years (continuation of Figure 20).

ingly well at all ages, a fact which is expressed by rank-order correlation coefficients in Table 74.

TABLE 74

RANK-ORDER CORRELATION BETWEEN AGE-GROUP PROFILES*

Age	16.5-Year High School	18.7-Year College Freshmen	22.4-Year College Seniors	22.5-Year High School 6 Years Later	25-Year Census Group	27.4-Year College Seniors 5 Years Later	27.7-Year College Freshmen 9 Years Later	32.4-Year College Seniors 10 Years Later	35-Year Census Group	45-Year Census Group	55-Year Census Group
15.5 ..	.93	.64	.49	.59	.57	.41	.41	.38	.66	.73	.89
16.5 ..	...	.82	.69	.66	.58	.61	.61	.58	.62	.67	.81
18.7 ..	...	...	.94	.79	.72	.87	.89	.85	.70	.66	.69
22.4 ..	...	...	...	.63	.57	.94	.89	.92	.56	.49	.59
22.5 ..	...	...	...	...	.90	.54	.69	.57	.80	.80	.58
25	...	...	...	...	...	.43	.60	.48	.95	.93	.70
27.4 ..	...	...	...	...	...	...	.94	.97	.43	.36	.47
27.7 ..	...	...	...	...	...	...	...	.96	.55	.50	.45
32.4 ..	...	...	...	...	...	...	...	...	.44	.39	.44
35	...	...	...	...	...	...	...	...	...	.95	.81
45	...	...	...	...	...	...	...	...	...	...	.83

* These correlations reflect the fact brought out below on page 279 that men regardless of age score low on certain occupations and score relatively high on other occupations. The use of correlations between interest profiles is considered below on page 372.

The data in Figures 20 and 21 exhibit changes in occupational-interest scores with increasing age, based on the records of our census group. Table 75 gives the occupational-interest scores of men scored on their own scale. For 29 occupations there is on the average a slight drop in score from 51.1 to 49.7, amounting to 1.4 standard scores, between the ages of 27.5 and 57.5 years. Analysis of the data shows very slight change in scores for seventeen occupations and only a summary of these data is reported in the table.[16] For the remaining twelve occupations there is a drop in interest score from 51.6 to 47.0, a difference of 4.6 standard scores, which is an appreciable amount. This decrease is characteristic of eleven of the twelve occupations. The exception is minister, where there is an increase in score with age from 46.0 to 52.9, a gain of 6.9 standard score.

[16] The 17 occupations are psychologist, architect, farmer, printer, policeman, physical director, social science teacher, musician, lawyer, office man, banker, chemist, production manager, artist, city school superintendent, sales manager, and president.

TABLE 75

RELATION OF AGE TO OCCUPATIONAL-INTEREST SCORE

(Members of each occupation scored on their own occupational scale)

Occupation		Age							Mean Score
		25	30	35	40	45	50	55	
District ranger	N	37	38	40	30	24	13	7	190
	M	53.2	52.5	51.5	47.5	46.0	47.9	38.2	50.0
Supervisor	N	..	18	17	11	30	11	12	100
	M	..	47.5	47.5	51.1	48.3	48.9	41.3	47.5
Assistant administrator	N	..	..	..	..	2	10	1	16
	M	..	..	..	..	45.2	44.5	32.5	42.8
Administrator	N	..	..	..	1	1	4	8	16
	M	..	..	..	42.5	52.5	51.3	31.9	36.3
Total of forest service	N	37	56	57	42	57	38	28	322
	M	53.2	50.9	50.3	48.3	47.3	47.7	37.5	48.2
Accountant	N	31	64	64	46	33	10	6	256
	M	49.3	52.5	52.0	48.9	48.8	48.0	46.2	50.5
Comptroller	N	5	14	23	11	12	2	2	70
	M	49.0	51.3	49.6	48.8	48.3	44.5	47.0	49.5
Engineer	N	13	40	88	125	120	72	50	510
	M	52.8	50.5	47.9	49.9	51.2	49.6	49.7	50.0
Physician	N	30	74	55	62	40	44	31	336
	M	51.2	53.1	48.5	50.0	51.0	46.7	46.4	50.0
Aviator	N	125	212	101	27	18	3	..	503
	M	52.6	50.5	48.2	44 2	45.6	43.7	..	50.0
C.P.A.	N	61	89	87	45	41	21	9	354
	M	52.5	51.2	49.5	45.4	46.0	48.0	54.9	50.0
Realtor	N	24	48	40	47	38	27	15	243
	M	49.3	53.9	49.5	50.2	48.6	47.9	45.0	50.0
Life insurance salesman	N	30	46	86	67	47	21	16	314
	M	52.3	54.4	50.7	49.1	46.6	44.1	47.9	50.0
Author-journalist	N	9	26	28	46	47	47	41	246
	M	44.8	49.7	49.9	52.4	49.4	52.3	46.5	50.0
Personnel manager	N	10	13	47	28	21	20	7	147
	M	54.5	44.7	52.2	49.3	50.3	44.0	42.0	50.0
Minister	N	16	38	49	39	37	42	29	250
	M	46.0	47.1	50.0	50.1	51.2	51.0	52.9	50.0
Total of 12 occupations	N	391	720	725	585	511	347	234	3551[a]
	M	51.6	51.2	49.7	49.2	49.1	48.5	47.0	49.9
Total, 17 other occupations	N	586	738	742	640	476	371	267	4010[b]
	M	50.8	52.5	49.4	50.0	49.3	50.3	52.0	50.1
Total of 29 occupations	N	977	1458	1467	1225	987	718	501	7561
	M	51.1	50.6	49.5	49.6	49.2	49.5	49.7	50.0

[a] There were additional cases below 25 and above 59.9 years of age not included in age distribution.

[b] There were 190 additional cases not included in age distribution.

The most noticeable change in occupational score with age is in the case of the forest-service scale, in which there is a drop from 53.2 to 37.5, a difference of 15.7 standard score. As this scale is based on rangers, supervisors, and assistant administrators, scores for four subgroups[17] are given in the table. A decrease in forest-service interest with age characterizes all four subgroups. The drop is gradual from 27.5 to 52.5 years, amounting to 5.5 standard scores, with a further drop of 10.0 scores within the next five years. (Evidently the forest-service interest scale must always be interpreted in the light of this relationship of age to score.)

The data in the table show, furthermore, that there are appreciable decreases in score with age, amounting to 10.5 for personnel manager, 7 for aviator, 5 for realtor and physician, and 4 for life insurance salesman. It is rather surprising to find such a large increase in score for minister and at the same time a large decrease for personnel manager, both of which are members of Occupational Group V. The other members of the group exhibit no, or only slight, decrease in score with age; but there are insufficient cases of older men among physical directors and social science teachers to establish the relationship in these two occupations.

The data in Table 75 do not agree entirely with those in Figures 20 and 21. There is, of course, no necessity that members of an occupation should exhibit the same trend as nonmembers. Here farmers, for example, show no increase in score with age, whereas they do in the figure. Forest-service scores drop in the table but rise slightly in the figure. Minister increases in score in the table but the reverse in the figure.

But aside from several exceptions it is clear that men in most occupations average about 50.0 on their own scale over the age range of 27.5 to 57.5 years.

Age changes in interests characteristic of different occupations.—One of the objectives of an earlier study[18] was to determine whether changes in interests with age caused occupational groups to become more or less alike as they advanced in years. It was

[17] Only a few assistant administrators are considered here, together with some top administrators whose blanks are not included in the criterion group.

[18] E. K. Strong, Jr., *Change of Interests with Age*, chapter v.

found that the average changes of all eight occupations studied were also typical of each of the eight. Furthermore:

> Although there are changes common to all eight groups, nevertheless the eight groups do not become more or less similar to the average of all eight as they advance in age. The differences between these groups (average intercorrelation is .008) far outweigh the differences between age groups or the changes common to all eight occupations. There is nothing here to suggest that the interests so characteristic of each occupational group wax or wane, or that the eight groups cannot be equally well differentiated at ages 25, 35, 45, and 55 years.[19]

Permanence of engineering interest among engineering students.—Several investigators have published data indicating that engineering interest declines among engineering students in college. Hubbard stated that "freshmen engineers seem more mechanically inclined than senior engineers graduating from the same university" (a statistically significant difference).[20] More recently Glass reported a distinct drop in engineering interest on the part of 201 engineering students at Purdue University during the three and a half years between freshman and senior years. Actually 79 per cent dropped 130 raw score on the unrevised scale and 21 per cent rose 59 raw score, giving an over-all drop of 91 (173 to 82, i.e., B+ to B). In contrast to the students who remained in the engineering school, the students who left college after one year increased their scores by 22 in the three-and-one-half-year period; the students who left after two years did not change their scores; and those who dropped out after three years decreased their scores by 45. Glass raises the question whether or not the engineering curricula had a "negative effect on the engineering interest scores."[21] Van Dusen has also reported a decrease

[19] *Ibid.*

[20] R. M. Hubbard, "Interests Studied Quantitatively," *Journal of Personnel Research* (1926), 4, 373.

[21] C. F. Glass, "An Investigational Analysis of Certain General and Specific Interests of Engineering Students" (unpublished Doctoral dissertation, Purdue University, 1934), pp. 22–29.

Further analysis indicated a drop of 116 raw score on the part of the younger students (aged 16–17), a drop of 89 for 18–19-year-old students, and a drop of 69 for older students, aged 20 to 27 years (p. 97). It is evident that many of the 201 students did not have engineering interests to start with, this being particularly true of the younger men, who averaged, respectively, 150 and 34 raw score (B+ and low B) on the scale.

in engineering interest at Florida University from —4.0 Q to —4.7 Q on the part of 76 students. Such mean scores are very low for engineering students. He has emphasized that these data differ from those on other groups of students in that the relationship between original score and changes in score is nonlinear, that is, original A and C ratings increased and B ratings decreased on the average.[22]

Data in Table 70 and Figure 20 clearly indicate a drop in engineering-interest score between ages 15 and 25. More detailed analysis indicates most of this decrease occurs before the age of entrance to college. Our college freshmen increased their mean engineering-interest scores between the ages of 18.7 and 27.7 by 1.9 standard score. The 26 engineering students in this group increased their score by .5. Stanford University engineering students differ from Purdue and Florida engineering students in averaging much higher in engineering interest when freshmen and showing no decrease in score thereafter.

There is no indication of nonlinear relationship between original score and change in score, as reported by Van Dusen, from the Stanford data. The relationship between 1927 score of seniors and change in score between 1927 and 1932 is as follows: 1927 score of —5, change in score 40; 5, 31; 15, 22; 25, 11; 35, 14; 45, —1; 55, —3; and 65, —5. These figures clearly indicate a negative relationship between original score and change in score with steadily decreasing amount of change from low to high scores on the original test. More comparable data are the following based on college freshmen tested then and nine years later:

		Engineering Score		
	N	1930	1939	Difference
Majored in engineering freshman year.....	26	47.3	47.8	.5
Majored in chemistry freshman year.....	5	48.2	49.8	1.6
Majored in engineering after graduation....	7	43.9	44.3	.4
Total	38	46.8	47.4	.6

The correlation between original score and change in score of —.40 can best be explained on the basis of regression (scores of

[22] A. C. Van Dusen, "Permanence of Vocational Interests" (unpublished Doctoral dissertation, University of Florida, 1938), p. 43.

60 had a decrease of 1.3; scores of 50, a decrease of 3.0; scores of 40, an increase of 2.0; and scores of 30, an increase of 5.3).

Occupational interest scores of adolescent boys.—The correlations between interest profiles of various age groups given in Table 74 emphasize the fact already discussed in chapter 6 that there is greater similarity than difference in interests at all ages, for the 66 coefficients range between .36 and .97, with a median of .66. The coefficients indicate, second, that occupational interests of 15.5-year-old boys differ most from the interests of men approximating 25 years of age—the correlation between 15.5 and 25-year-old men is .57, which rises to .66 with 35-year-old men, and to .89 with 55-year-old men. The data from 16.5-year-old high-school boys confirm this relationship.

The occupational-interest scores of adolescent boys are the resultant of at least two influences. First, boys score low on certain occupations and relatively high on other occupations presumably because men in general score that way (see Figures 20 and 21). At least the seven age groups in Tables 195 and 196 (p. 720), score below 23 on the following:

	Correlation with IM
Psychologist	—.14
Mathematician	—.47
Y. secretary (except at age 25)	.84
City school superintendent	.63
Minister	.54
C.P.A. (except at ages 18.5 and 22.4)	.09

And the seven groups score above 32 on the following:

	Correlation with IM
Production manager	.01
Farmer	—.29
Printer	.03
Policeman (score at ages 18.5 and 22.4)	.27
Office man	.61
Purchasing agent	.03
Realtor	—.02

It is obvious that the two groups of occupations are not to be distinguished on the basis of interest maturity. The guess may be hazarded that men on the average score low on the first list of oc-

cupations because few men belong in such occupations and they score relatively high on the second list because for the most part many men function therein.

Second, occupational-interest scores of adolescent boys are affected by interest maturity. Such boys score relatively high on some occupations which correlate negatively with IM (are associated with immaturity of interests), and they score the reverse on some occupations which correlate positively with IM. A decade later they score much lower on the former and much higher on the latter. The change here is related to increasing interest maturity. For example, if we consider only changes in rank order of ten or more among the 34 occupations considered, then 15.5-year-old boys score higher than 25-year-old men on the following:

	Correlation with IM
Physician	−.51
Dentist	−.39
Engineer	−.44
Journalist	−.45
Artist	−.53

And they score lower than 25-year-old men on the following:

	Correlation with IM
Office man	.61
Life insurance salesman	.27
Accountant	.52
Y. physical director	.67
Social science teacher	.75
Personnel manager	.75

The first five occupations are among the seven listed at the bottom of Table 70, i.e., have low correlations with IM, while the other six occupations are among the eleven listed at the top of the table. Or, expressed in terms of changes in mean scores, the ten occupations with lowest negative correlations with IM average 7.2 standard scores lower at age 25 than at age 15.5, whereas the ten occupations with highest positive correlations with IM average 9.3 scores higher at age 25 than at age 15.5. Essentially the same changes occur with high-school boys tested when 16.5 years of age and retested when 22.5 years old; only here the changes amount to only about two-thirds of the amount recorded by the former group.

Stability of interests and IM.—Another question in this connection is: Are the occupational interests of boys with high IM scores more stable than those of boys with low IM scores? Such evidence as we have so far accumulated indicates that this is the case. Consider the data of three groups of high-school juniors composed, respectively, of the ten with lowest IM score, the ten with IM scores equal to the median of the entire group, and the ten with the highest IM score. The mean IM scores of the three groups at ages 16.5 and 22.5 are, respectively, 28 and 45, 45 and 51, and 60 and 59. The corresponding mean scores for the entire groups are 44 and 53. The rank-order correlations between profiles of mean occupational scores of the three groups are, respectively, .68, .79, and .91. Evidently the higher the IM score at 16.5 years the less chance there is for occupational scores to change in the next few years and the more likely it is that such scores will agree on both occasions.

A comparison of the occupation ratings at ages 16.5 and 22.5 for the three subgroups substantiates this. The ten boys with low IM had the following average ratings at age 16.5:

A Rating	B+ Rating	B Rating
Physician	Artist	Architect, Dentist
	Engineer	Mathematician, Chemist
	Farmer	
	Realtor	
	Journalist	Lawyer
	President	

And at age 22.5 their ratings were:

A Rating	B+ Rating	B Rating
		Physician, Dentist
	Engineer, Chemist	
		Production manager
	Farmer, Printer	Mathematics-science teacher
		Musician
		Purchasing agent
	Realtor	

There is considerable change in interests here. The ten boys with median IM scores had B+ ratings in farmer, printer, and musician on the first occasion and B+ ratings in production manager and printer on the second occasion. Farmer dropped from 44 to 36 and musician from 40 to 38, and production manager rose from

37 to 41. The B ratings were quite similar. Here is surprisingly little change. The ten boys with highest IM score had ratings as follows when 16.5 years old:

A Rating	B+ Rating	B Rating
		Printer, Mathematics-science teacher, Policeman
	Social science teacher	Physical director, Personnel, Y. secretary
Office man		Accountant
		Sales manager, Realtor, Life insurance salesman

And when 22.5 years old the ratings were:

A Rating	B+ Rating	B Rating
		Printer
	Personnel manager, Social science teacher	Physical director, Y. secretary
		Office man
		Sales manager, Realtor
		Advertiser

The changes are all small in terms of scores, with the exception of office man, which dropped from 46 to 39.

These data indicate that interest profiles of men with low IM, particularly those of adolescent boys, are more likely to change in the next decade than profiles of men with IM score approximating 50 and that the change is likely to be in the direction of decreased interest in scientific pursuits.

CHANGE OF INTERESTS WITH AGE AMONG WOMEN

It might be presumed that women's interests would change with age in much the same way as do men's interests. But recognizing that women mature earlier than men it might be assumed that their interests would change less from 15 years on than do men's interests. The only study known to the writer that bears on the subject is that by Laleger,[28] who reports correlations between age and occupational interest scores on 17 scales. The coefficients range between .12 and —.26, averaging —.05. The data are based on the records of 703 third-year high-school students who ranged in age from 13.4 to 20.8 years, averaging 16.75 years (σ of .95 year). Nearly half of the girls fall in the year range of 16.5 to 17.5 years.

[28] G. E. Laleger, *The Vocational Interests of High School Girls* (Teachers College, Columbia University, Contributions to Education, 1942, No. 857), p. 74.

THE 25–55-YEAR IM SCALES

It will be recalled that two different scales were developed to measure interest maturity between 25 and 55 years of age. The first scale was based upon the records of 215 men, 23 to 27 years of age and of 151 men, 50 to 59 years of age, all of whom belonged to the 1,000 men group purporting to be a good sample of men in the United States.

A smoothed curve (A)—see Figure 22—shows the general trend in scores on this IM scale from 15 to 55 years of age. Twenty-two-year-old men have the lowest score—that is, their interests differ the most from those of 55-year-old men. Men younger than 22 years have successively higher scores up to 15 years; the

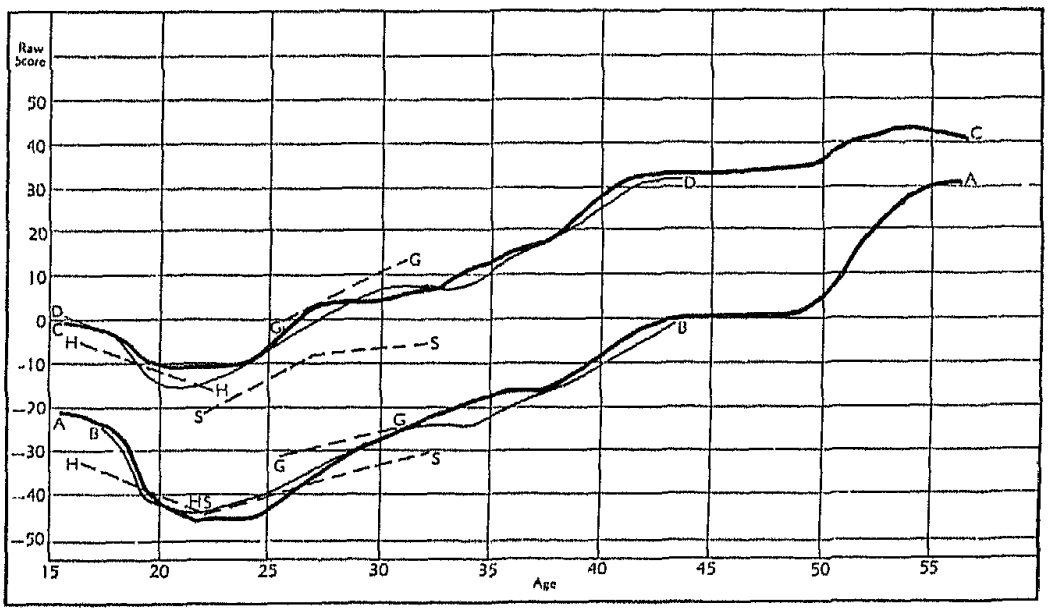


FIG. 22.—Mean scores on (*a*) revised 25–55-year IM scale and (*b*) 25–55-year IM scale based upon representatives of eight occupations.

Revised 25–55-year IM scale:

Curve A based upon "census" and high-school groups.

Curve B includes data in A and records of college students.

25–55-year IM scale based upon representatives of 8 occupations:

Curve C based upon "census" and high-school groups.

Curve D includes data in C and records of college groups.

All four curves start with 15-year criterion group. All are smoothed curves from 18 years upward. Dotted lines connect repeated test on high school (*H*), college seniors (*S*), and graduate students (*G*).

same holds true for older men. It would consequently be impossible to differentiate on this scale men between ages 15 and 20 from those between ages 25 and 33 years. This reversal in the slope of the curve at age 22 years agrees with all our findings that changes in interests between 15 and 25 years are in general opposite to the changes between 25 and 55 years.

Curve A in Figure 22 is based on the records of the 15-year-old group, the census group, and the high-school junior group. Curve B gives the smoothed curve when data from college seniors and graduate students are included. Since the two curves very nearly coincide, it is evident that the records of 834 college seniors and graduate students agree very closely with the 674 cases drawn from the census group between the ages of 20 and 37 years. As far as all the available data go they strongly suggest that changes in interests between ages 25 and 55 years, based on a sample of men in the United States, are similar to the changes occurring among better-educated men.

This scale has not been published because there is no practical value in determining interest maturity among adult men and, more particularly, because men with extremely youthful interest can equally well be assigned to ages 15 to 20 and to 25 to 33 years. The data do aid, however, in our understanding of how changes in interests occur among adult men. One conclusion is that such changes are uniform from year to year throughout the period from 25 to 55 years, since age averages can be well represented by a straight line.

The 25–55-year IM scale based on representatives of eight occupations only.—This scale is based on records reported in *Changes of Interest with Age* (see p. 255 above). Smoothed curves, C and D, corresponding to A and B, are given in Figure 22. Here again the changes in interests of highly educated men correspond very closely with those based on men in general.

It is of interest that the two sets of curves (A and C, also B and D) should agree so closely in every respect when they are based on two entirely different sets of records—one representative of men in general, and the other of the eight occupations typical of professional men; furthermore, it is of interest that men of average and of superior education should score practically the

same on both scales. Evidently education does not affect the changes in interests which occur with age after 25 years of age.

Age and interest.—Neither Figure 19 nor 22 alone properly describes the changes of interests with age. The first curve is designed to show the changes between 15 and 25 years of age. Herein there is evident a very rapid rise to about 23 years. The second curve is designed to show the changes between 25 and 55 years. As drawn, it shows a steady rise from 23 to 55 years. If the plus and minus weights on this scale were reversed, the curve would show a steady drop from 23 to 55 years. This is the way the curve should really be drawn so as to fit in with the first curve covering the decade from 15 to 25 years. With this reversal in mind we can conclude that interests change rapidly from those held at 15 years to those held at about 25 years, and then shift in the reverse direction much more slowly from about 25 years to 55 years.

Meaning of IM.—Statistically IM is the quantitative measurement of the differences in interests of 15- and 25-year-old men—the degree to which one has the interests of the latter in contrast to the former. Our data indicate, however, that IM is not closely associated with age, since the correlation between the two is only about .50. Our data indicate, moreover, that it is associated with occupational interests, negatively with scientific and linguistic interests, and positively with office-worker-accountant interests and with interest in people (Groups V and IX). Sollenberger states "that the degree of maturity of the expressed interests and attitudes of the [13 to 16 years of age] boys correlated higher with hormone activity than they did with chronological age."[24] Differences in hormone activity may possibly be found to correlate with IM: if so, there would be a physiological explanation as to why some men become scientists and some ministers.

[24] R. T. Sollenberger, "Some Relationships between the Urinary Excretion of Male Hormone by Maturing Boys and Their Expressed Interests and Attitudes," *Journal of Psychology* (1940), **9**, 188.

Chapter 13. Change of Interests with Age

The preceding chapter has recorded the development of the interest-maturity scale and presented some information regarding changes in interests with age as measured by the scale. Additional material on the subject is given in this chapter, which deals primarily with the original data of the interest test, i.e., the likes and dislikes of men at various ages.

GENERAL TREND IN INTERESTS WITH AGE

From one point of view, interests remain remarkably constant from fifteen years of age onward. This is shown by the high correlations in Table 9 (p. 91)—interests of 25- and 55-year-old men correlate .88, interests of 15- and 25-year-old men correlate .82, and interests of 15- and 55-year-old men correlate .73. These high correlations indicate that there are far more similarities among interests from 15 to 55 years than there are differences.

Correlation measures rank order, not necessarily changes in amount. That is, the high correlations stated mean that on the whole the items that are well liked in early life are the items that are well liked later on, and vice versa. But this does not prevent an increase or a decrease in the number of items which are liked from decade to decade.

Liking and disliking change somewhat in the forty years under consideration—see Table 20, page 103. All the items on the blank are liked by 27.9 per cent of 15-year-old boys, by 35.6 per cent of 25-year-old men,[1] and by 33.7 per cent of 55-year-old men. Here is an increase in liking of 7.8 per cent from 15 to 25 years of age. Considering only differences which are statistically sig-

[1] Data from our 25-year-old group, representatives of men-in-general, agree very closely with similar data from college freshmen and seniors as reported by Burnham and Glass. See Table 175, p. 667.

nificant, we may add the fact that there is a corresponding decrease of 9.7 per cent of dislikes for the same decade. But these changes are not typical of all types of interests. There is a decrease in disliking occupational items of 19.1 per cent between 15 and 25 years of age, accompanied by an increase of 8.9 per cent in liking and 10.2 per cent in indifference. There is similarly a decrease in disliking school subjects of 17.0 per cent, with an increase in liking of 14.4 per cent. There is also a decrease in disliking amusements of 10.9 per cent and in disliking activities of 13.1 per cent, which is accompanied in the latter case by an increase of liking of 12.2 per cent. None of the changes from 25 to 55 years is statistically significant.

One other change may be noted: 47.1 per cent of 15-year-old boys report they are not sure whether or not they possess certain abilities (Part VIII); this percentage drops to 35.8 per cent at 25 years of age.

Data from the *Pressey X-O Test* confirm our findings regarding increase in likes and decrease in dislikes between 15 and 25 years. Chambers[2] reported that the number of likes of students remained fairly constant from the 7th to the 11th grade and then increased in number up to the senior year in college. Disapprovals, on the other hand, decreased in number from the 7th grade to the senior year in college. Buck[3] repeated the test upon college students ten years later and obtained figures comparable to ours for likes but fewer disapprovals, which he attributes to changes in mores.

Another way of summarizing changes in amount of liking and disliking with our data is to consider "attitudes"—the difference between liking and disliking. On the whole, there is a shift from a slightly negative attitude (—9.5) to a slightly positive attitude (8.0) between the ages of 15 and 25 years, with practically no change during the next thirty years. Here again the average of all the items does not summarize the different kinds of items very well. Occupational items are more disliked than liked at all ages.

[2] O. R. Chambers, "Measurement of Personality Tests," *Research Adventures in University Teaching* (Public School Publishing Co., 1927), pp. 71–85; and "A Method of Measuring the Vocational Maturity of Children," *Pedagogical Seminary* (1925), **32**, 637–47.

[3] W. Buck, "A Measurement of Changes in Attitudes and Interests of University Students over a Ten-Year Period," *Journal of Abnormal and Social Psychology* (1936), **31**, 12–19.

This is also true of the items concerning people. On the other hand, items relative to amusements are more liked than disliked.

All in all there are some changes with age in the number of items that are liked and disliked, particularly between 15 and 25 years of age, but the changes are surprisingly small, certainly so in terms of popular opinion on this point.

Two trends observable.—So far we have considered changes in interests for all the 400 items on the blank together, or for all the items of a certain type as a group. Here there is noticeable but one trend, i.e., an increase in liking up to 25 years and a decrease in liking thereafter. The latter change is, however, much less in amount than the former.

But when each item is considered separately, as was done in the preceding chapter, it appears that two-fifths of items increase or decrease in liking from 15 to 55 years of age and two-fifths increase or decrease in liking from 15 to 25 years and reverse this trend from 25 to 55 years; the remaining items exhibit one trend with certain groups of individuals and the other trend with other groups of individuals. As in both these trends the number of items which increase in liking exceeds the number which decrease in liking between 15 and 25 years, with the reverse situation between 25 and 55 years, any summary of most groups of items will disclose only one trend, namely, increase in liking up to 25 years and decrease in liking thereafter.

FACTOR OF FAMILIARITY WITH ITEMS

Why is there such a decided increase in liking items between 15 and 25 years of age? Is it caused by increasing knowledge and experience with the items? In other words, is lack of familiarity with the items the cause of lack of liking for them?

If familiarity is necessary for liking, the hypothesis must be advanced that when one is unfamiliar with a situation one will respond by indifference or dislike but not by liking. Only after the situation is understood or appreciated is it possible to like it. This does not mean the situation need be completely appreciated in order for there to be liking, but merely that some part of the total situation has been encountered. Liking under the latter con-

dition may change to disliking when other parts of the situation are appreciated. Thus a small boy may want to join the army when he witnesses a parade, but later on when he understands what is involved he may have no interest in that occupation.

In order to determine the familiarity of the occupations listed in Part I of the *Vocational Interest Blank* a number of psychologists ranked each of the one hundred occupational items on a five-step scale according to the familiarity of a 15-year-old boy with each. Auto repairman was rated highest in familiarity (1.2) and certified public accountant lowest in familiarity (5.0). There are evidently two conceptions of the term "familiarity." Several psychologists contended that sculptor was quite familiar since children are given lessons in modeling clay. Other psychologists contended that children could not possibly understand or appreciate the real essence of creating a sculptured object and rated this occupation 4 instead of 1. Familiarity may then be viewed as merely the result of physical contact with the object or as the comprehension or appreciation of the object after physical contact with it. It is evident that our psychologists had both aspects of familiarity in mind. School teacher should be among the most familiar of all occupations from the physical contact point of view, yet all psychologists ranked it 2, whereas nearly all ranked auto mechanic 1. They considered a boy understood from actual experience what an auto mechanic is trying to do, whereas, never having actually taught school, he could not so thoroughly appreciate that occupation. The rating for familiarity must be construed as reflecting both aspects, as a compromise between the two aspects in the case of many of the occupational items.

As an actual fact the second conception of familiarity is the only true one, since no one would say a small child was familiar with the occupation of judge even though the child's father was a judge and allowed the child to attend court. The child must appreciate the meaning of the actions he witnesses before he can be said to be familiar with the performance.[4] This capacity to appreciate is evidently more important than the factor of physical con-

[4] "Mere exposure to a subject is not sufficient in and of itself to provoke a sense of special ability and liking." M. R. Chauncey, *The Educational and Occupational Preferences of College Seniors* (Teachers College Contributions to Education, 1932), No. 533, p. 68.

tact, for many occupations rated low in familiarity by our experts are as well liked by 15-year-old boys who could know about them only through reading, the radio, and the movie.

Greatest increase in liking occupations in those least familiar at 15 years of age.—When the one hundred occupations are divided into four approximately equal groups in terms of familiarity to 15-year-old boys (see Table 76), it appears that the most familiar group is liked by 22.5 per cent of boys and the least familiar by 14.4 per cent of boys. The first group increases in liking up to 25 years by 3.6 per cent, the fourth group by 13.2 per cent. The same relationships are apparent when attitude is considered instead of liking. As there is no appreciable difference in liking or attitude among the four groups of items at 55 years, these differences are not caused by inherent interest in the occupations. Less liking at age 15 is the result of lack of familiarity with occupations.

TABLE 76

RELATIONSHIP OF FAMILIARITY OF OCCUPATIONS TO LIKING FOR THEM

Rating in Familiarity	No. of Items	Percentage of Likes			Difference		Attitude Index			Difference	
		At 15 Years	At 25 Years	At 55 Years	Between 25 and 15	Between 55 and 25	At 15 Years	At 25 Years	At 55 Years	Between 25 and 15	Between 55 and 25
1.1–2.0 ..	23	22.5	26.1	22 5	3.6	—3.6	—28.2	—11.5	—15.2	16.7	—3.7
2.1–2 6 ..	26	16.0	22.5	23.2	6.5	0.8	—39.9	—16.7	—15.7	23.2	1.0
2.7–3.4 ..	31	18.9	31.1	26.3	12 2	—4.7	—36.2	—1.5	—10.0	34.7	—8.5
3.5–5.0 ..	20	14.4	27.6	23.8	13.2	—3.8	—41 4	—4.0	—12.2	37.5	—8.3

The correlation between familiarity and amount of change in dislikes between 15 and 25 years of age is —.42. Such a correlation of —.42 is not large; but a high correlation is not to be expected, since increasing familiarity with an item will sometimes cause a change from dislike to indifference or like and sometimes cause no change in response—the dislike now being a genuine dislike based on experience instead of being a reaction to mere unfamiliarity.

It would appear, then, that certain of the one hundred occupations are not sufficiently familiar to 15-year-old boys for them to express liking for them. Ten years later they have the necessary familiarity and some of the former dislikes have been changed to

indifference or liking. From Table 20 (p. 103) it appears that there is such a change amounting to a decrease in disliking of 19.1 per cent and to an increase in indifference of 10.2 per cent and in liking of 8.9 per cent.

TABLE 77

PERCENTAGE OF LIKES AT 15, 25, AND 55 YEARS OF AGE FOR SCHOOL SUBJECTS, CLASSIFIED ACCORDING TO THE SCHOOL GRADE IN WHICH THEY ARE FIRST ENCOUNTERED

No. of Items	School Subjects	Age 15	Age 25	Age 55
18	First studied in grammar school.....	37.8	54.4	49.6
10	First studied in high school.....	28.8	35.5	34.5
8	First studied in college.....	19.4	38.5	33.3

School subjects have not been rated for familiarity but have been classified according to the school grade in which they are first encountered. It is evident that the subjects which are studied in grammar school are liked better by 15-year-old boys than the subjects first studied in high school or college (see Table 77). By 55 years of age the school subjects first encountered in high school or college are equally well liked, but neither of them are ever as well liked as the subjects of the grammar school. Consequently we cannot be sure whether grammar-school subjects are liked better by 15-year-old boys than subjects first encountered in high school and college because of their familiarity or because of their intrinsic interest to males of all ages.

Most items familiar to 15-year-old boys.—Increase in liking occupational items is apparently associated with increase in familiarity. It is likely the same holds true to some degree for other items. Changes in interest between 15 and 25 years may, accordingly, be explained in part on the basis of familiarity.

But when amount of liking for all items is considered, not change in liking, it is evident that amount is not affected to any appreciable degree by familiarity. Table 78 shows very clearly that there is a great difference between the most-liked and the least-liked occupations at the three age levels of 15, 25, and 55 years. (The differences in all cases are statistically significant.) At age 15 the most-liked are also the more familiar, but the difference in familiarity of the most- and the least-liked occupations is not statistically significant. At ages 25 and 55 the most-liked are actually

less familiar for 15-year-old boys by a slight amount. Familiarity cannot, then, be a potent factor in determining liking and disliking of occupations at these age levels.

TABLE 78

PERCENTAGE OF LIKES OF MOST- AND LEAST-LIKED OCCUPATIONS AT AGES OF 15, 25, AND 55 YEARS OF AGE

	Percentage of Likes			
	Age 15	Age 25	Age 55	Familiarity Index
25 Most-liked occupations at age 15	37.1	38.3	32.3	2.5[a]
25 Least-liked occupations at age 15	5.4	16.1	16.9	3.0
25 Most-liked occupations at age 25	31.5	42.5	34.9	2.8
25 Least-liked occupations at age 25	8.6	11.8	14.6	2.5
25 Most-liked occupations at age 55	26.3	36.8	39.4	2.9
25 Least-liked occupations at age 55	10.8	17.0	11.0	2.8

[a] Critical ratio of difference between 2.5 and 3.0 is only 1.9.

The following coefficients establish this fact possibly more clearly than Table 78:

Familiarity of items of 15-year-old men correlated with	r
Likes of 15-year-old men	.21
Likes of 25-year-old men	−.11
Likes of 55-year-old men	−.04
Dislikes of 15-year-old men	−.17

An item must be familiar before it can be liked. But because an item is familiar does not mean it will be liked; it merely means that now it can be either liked or disliked. Evidently most items on the blank are sufficiently familiar for even 15-year-old boys to respond by liking as well as by disliking. The increase in liking which does occur between 15 and 25 years is made possible by increased familiarity with some items.

Sophistication, liberalism, conservatism. — The question was raised at the beginning of the preceding chapter whether or not there was a shift from liking to indifference, indicative of increasing blaséness or sophistication, or a shift from disliking to indifference, indicative of a trend toward liberalism. Whether such shifts in interest are indicative of sophistication or liberalism, as Burnham[5] suggests, need not be debated, since neither of these

[5] P. S. Burnham, "Stability of Interest Test Scores" (unpublished Doctoral dissertation, Yale University, 1935), pp. 59–61.

trends is indicated here. The major change is from disliking to liking between ages 15 and 25 years, and this is true not only of the averages of all items but of all subgroups of items. (The subgroup of "present abilities" cannot be considered in this connection, as the responses called for are not those of like, indifference, and dislike.)

Ruch[6] defines conservatism "as an attitude of resistance to change. A conservative is thus one whose interests and likes and dislikes are permanent. He is one [who] is unwilling to experiment with new institutions and is, in fact, more than willing to let well enough alone."

Variations in individuals with respect to Burnham's sophistication or liberalism and Ruch's conservatism must needs be answered in terms of the individual scores of men and women, with which we are not now concerned. Differences in age groups are, however, before us. Such differences are too small to be of concern between 25 and 55 years, but they are noticeable between the ages of 15 and 25 years. The decrease in disliking and lesser increase in liking in this decade may be pointed to as proof that adolescents are more intolerant, or less conservative, than adults. The writer believes, on the contrary, that such changes are an indication of a narrower range of interests on the part of young boys occasioned by lack of experience. In terms of the definition given above for conservatism, all men regardless of age are conservative—once they have had sufficient experience to be familiar with an item, they establish a relationship of liking or disliking to it and they tend to maintain that relationship thereafter.

WHAT 15-YEAR-OLD BOYS LIKE

The fourteen occupations in which 15-year-old boys are most interested[7] are listed in Table 79. They typify mechanical and out-of-door pursuits. They are the only occupations which are

[6] F. L. Ruch, "The Differential Decline of Learning Ability in the Aged as a Possible Explanation of Their Conservatism," *Journal of Social Psychology* (1934), 5, 334.

[7] "Interested" is used in this connection as synonymous with attitude index, i.e., difference between percentages of likes and dislikes.

TABLE 79

FOURTEEN OCCUPATIONAL ITEMS FOR WHICH 15-YEAR-OLD BOYS HAVE A POSITIVE ATTITUDE

Occupations	Likes			Difference in Likes		Attitude			Difference in Attitude	
	Age 15	Age 25	Age 55	25–15	55–25	Age 15	Age 25	Age 55	25–15	55–25
Aviator	63	55	16	—8	—39	49	43	—32	—6	—75
Explorer	56	61	53	5	—8	35	52	34	17	—18
Inventor	50	52	41	2	—11	27	37	25	10	—12
Secret service man	47	50	27	3	—23	19	29	—12	10	—41
Electrical engineer	44	45	48	1	3	16	23	30	7	7
Civil engineer	43	52	48	9	—4	17	31	35	14	4
Athletic director	42	44	22	2	—22	15	23	—12	8	—35
Locomotive engineer	42	41	37	—1	—4	12	16	10	4	—6
Mechanical engineer	42	43	45	1	2	10	21	22	11	1
Ship's officer	41	31	17	—10	—14	9	1	—20	—8	—21
Marine engineer	39	34	23	—5	—11	7	6	—8	—1	—14
Auto racer	39	36	9	—3	—27	3	3	—45	0	—48
Auto repair man	37	30	28	—7	—2	6	—4	—9	—10	—5
Machinist	36	33	49	—3	16	1	—2	26	—3	28
Average	44.3	43.3	33.0	—1.0	—10.2	16.1	19.9	3.1	3.7	—16.7

TABLE 80

FOURTEEN OCCUPATIONS OF LEAST INTEREST TO 15-YEAR-OLD BOYS

Occupations	Likes			Difference in Likes		Attitude			Difference in Attitude	
	Age 15	Age 25	Age 55	25–15	55–25	Age 15	Age 25	Age 55	25–15	55–25
Undertaker	2	4	1	2	—3	—83	—77	—76	6	1
Auctioneer	3	10	16	7	6	—74	—53	—36	21	17
School teacher	6	20	19	14	—1	—72	—29	—31	43	—2
Poet	6	15	11	9	—4	—71	—40	—41	31	—1
Real estate salesman	5	10	21	5	11	—70	—42	—23	28	19
Floorwalker	5	7	11	2	4	—69	—59	—54	10	5
Social worker	4	22	32	18	10	—68	—16	—7	52	9
Statistician	3	13	16	10	3	—68	—30	—30	38	0
Specialty salesman	3	13	21	10	8	—68	—36	—25	32	11
Life insurance salesman	5	9	11	4	2	—67	—48	—45	19	3
Music teacher	6	8	9	2	1	—66	—45	—41	21	4
Clergyman	5	11	11	6	0	—65	—43	—42	22	1
Politician	7	27	15	20	—12	—65	—13	—42	52	—29
Florist	5	14	31	9	17	—65	—33	—3	32	30
Average	4.6	13.0	16.1	8.4	3.0	—69.4	—40.3	—35.4	29.1	4.9

liked by more boys than disliked (positive attitude). The occupation, rancher, is liked by 38 per cent of boys and disliked by 39 per cent, giving an attitude index of —1. These fifteen occupations are the most-liked (disregarding dislikes) of all 100 occupations. It is to be noted that these most-liked occupations at 15 years of age do not increase on the average in liking by 25 years of age; on the contrary, they decrease one per cent and then decrease ten per cent more during the years from 25 to 55.

The fourteen occupations of least interest to 15-year-old boys are listed in Table 80. Ten of the fourteen typify selling and giving advice and assistance to people. They increase in interest from age 15 to 25 and on to 55 years.

Tables 81 and 82 list, respectively, the 39 most- and least-liked items included in the blank but excluding occupational items. Only the two most-liked occupations—aviator and explorer—would be included in Table 81, if occupational items were included, but all of the occupations in Table 80 would be so included in Table 82. The 41 most-liked items, including aviator and explorer, typify interest in physical skill and daring (11 items), mechanical and scientific pursuits (7 items), amusements such as movies, museums, vaudeville, musical comedy, and picnics (6 items), people with desirable traits (5 items), working conditions emphasizing working for oneself with opportunity for advancement (5 items), and several miscellaneous items.

The 49 least-liked items listed in Tables 80 and 82 typify little interest in people with undesirable traits (18 items), selling and advertising (8 items), giving advice to people (6 items), and 18 miscellaneous items.

Boys admire Thomas A. Edison and Henry Ford but have little interest in the careers of Charles Dana Gibson, John Wanamaker, and William H. Taft. They enjoy reading *Popular Mechanics* and the *National Geographic Magazine* but not *System* and the *New Republic*. There is no school subject that they are enthusiastic about, but they have very little interest in sociology and economics, neither of which they have yet had an opportunity to study. They like very much several amusements, listed above—there is only one amusement included among the least-liked items and that is "smokers."

TABLE 81

ITEMS MOST LIKED BY 15-YEAR-OLD BOYS—OCCUPATIONAL ITEMS NOT INCLUDED

Items	Likes			Attitude		
	Age 15	Age 25	Age 55	Age 15	Age 25	Age 55
Hunting	86	76	51	81	66	30
Athletic men	85	82	72	83	80	66
Driving an automobile	84	87	69	80	84	61
Fishing	83	71	57	77	58	38
Thomas A. Edison	82	63	75	78	59	70
Popular Mechanics	82	67	58	76	59	52
Work which interests you with modest income vs. work which does not interest you with large income	71	82	73	63	76	65
National Geographic Magazine	71	70	67	61	65	62
People who have done you favors	70	88	86	62	88	85
Small pay, large opportunities to learn during next five years vs. good pay, little opportunity to learn during next five years	70	84	56	61	77	35
Progressive people	70	81	76	59	74	72
Henry Ford	69	52	47	61	38	28
Operating machinery	69	66	63	59	52	47
Playing baseball vs. watching baseball	69	52	19	55	34	−20
Operate new machine	68	51	58	60	39	46
Saving money	68	72	75	60	68	67
Energetic people	68	85	79	56	82	72
Work for yourself vs. carry out general program of superior who is respected	68	53	59	56	36	40
Do a job yourself vs. delegate job to another	67	65	66	55	49	54
Physical training	67	68	56	54	60	44
People who are natural leaders	66	83	80	55	79	75
Opportunity for promotion	65	66	37	53	50	14
Handling horses	65	46	58	51	25	42
Accept just criticism without getting sore	64	82	72	53	76	60
Definite salary vs. commission on what is done	64	61	55	51	46	29
Travel movies	62	84	79	47	83	74
Manual training	61	61	54	47	48	44
Museums	61	72	79	44	67	74
Chauffeur vs. chef	60	65	54	49	52	38
Educational movies	59	77	70	46	74	64
Vaudeville	59	66	71	39	60	62
Listening to a story vs. telling a story	58	56	58	43	46	51
Musical comedy	58	77	70	38	72	63
Picnics	57	62	61	41	50	50
Sporting pages	57	64	42	41	56	24
Discussing my ideals with others	57	74	68	36	57	52
Thrifty people	56	67	78	41	62	70
Repairing electrical wiring	56	55	52	37	39	33
Can carry out plans assigned by other people	55	81	78	47	76	68
Average of 39 items	66.8	69.6	63.5	55.3	60.6	51.3

TABLE 82

ITEMS LEAST LIKED BY 15-YEAR-OLD BOYS—OCCUPATIONAL ITEMS NOT INCLUDED

Items	Likes			Attitude		
	Age 15	Age 25	Age 55	Age 15	Age 25	Age 55
People who borrow things	2	1	2	−74	−79	−81
Absent-minded people	3	2	3	−68	−69	−61
Pessimists	3	3	1	−63	−63	−63
Quick-tempered people	4	4	5	−73	−73	−62
People who talk about themselves	5	3	1	−66	−76	−71
House-to-house canvassing rather than retail selling	5	1	8	−44	−74	−51
Bolshevists	6	6	2	−49	−56	−67
People who get rattled easily	6	5	3	−48	−41	−51
Fortune tellers	7	10	7	−55	−57	−61
People who talk very loudly	7	3	1	−55	−73	−63
House-to-house canvassing rather than gardening	7	7	11	−50	−68	−61
Carelessly dressed people	7	7	5	−49	−59	−54
Spendthrifts	7	7	5	−47	−49	−71
Men who use perfume	7	3	4	−47	−67	−59
Socialists	7	13	12	−40	−16	−25
Decorating a room with flowers	8	28	40	−47	1	24
Interest the public in a machine	8	18	17	−46	−32	−38
Co-workers congenial, competent, and adequate in numbers	8	16	16	−43	−25	−28
Charles Dana Gibson	8	12	10	−41	−30	−33
System	8	25	40	−34	13	27
New Republic	8	17	18	−34	6	3
Usually ignore the feelings of others	8	4	5	−33	−58	−45
John Wanamaker	8	20	17	−30	−16	−10
Jealous people vs. conceited people	8	15	14	−20	− 4	0
William H. Taft	8	21	13	−17	− 1	−13
Fat men vs. thin men	8	5	14	−10	−14	0
Looking at a collection of rare laces	9	10	13	−56	−43	−33
Teaching adults	9	33	28	−54	11	2
Interviewing clients	9	31	29	−43	5	− 7
Men who chew tobacco	9	6	10	−42	−33	−26
Sociology	9	27	27	−41	9	6
Nervous people	9	16	14	−40	−21	−25
Economics	9	52	37	−36	40	20
Prepare advertising for machine	9	15	12	−33	−24	−29
People who do not believe in evolution	9	13	11	−30	0	−17
Jealous people vs. spendthrifts	9	10	17	−21	−20	− 2
Smokers	10	36	36	−55	12	11
People with protruding jaws	10	11	3	−28	−18	−28
People with hooked noses	10	9	6	−24	−18	−24
Average of 39 items	7.5	13.5	13.3	−43.2	−29.5	−29.9

CHANGES IN INTERESTS FROM 15 TO 25 YEARS OF AGE

It has already been pointed out that interests of 15-year-old boys and 25-year-old men agree in large measure. But, as we have seen, there are nevertheless some differences in the interests of these two age groups. The most noticeable difference is the increase in the percentage of items which are liked by 25-year-old men as compared with the younger group. In addition to this general trend there are several more specific trends which affect differences in interests at 15 and 25 years of age. Before discussing these specific trends it is necessary to consider how they have been identified.

Classification of interests.—Because one becomes lost in the maze of all the 400 items on the interest blank it is necessary to resort to some sort of grouping or classification of the items. The classification used here was developed in connection with the earlier investigation, reported in the author's *Change of Interests with Age.*[8] It was evolved after much trial and error and represents his best judgment. It is unlikely that another would devise the same groupings or would include precisely the same items under the headings used here.

Whatever classification was attempted, there were always some items which seemed to belong together without question and there were other items which might or might not be included, depending upon one or more considerations. For example, the items "auctioneer" and "life insurance salesman" clearly should be included under the classification "occupations involving selling." But how about "florist" or "buyer of merchandise"? A florist raises flowers and sells them; a buyer of merchandise buys and usually sells. Attempts to include such items on a partial basis as counting only one-half or one-third weight had to be given up. There was no satisfactory way of determining such fractions. Finally it was decided to include all such questionable cases wherever they seemed to fit. Consequently, "florist" is included with the occupations relative to selling, also with those relative to retail stores and with those relative to raising plants. This means that averages

[8] E. K. Strong, Jr., *Change of Interests with Age* (Stanford University Press, 1931), chapter iv.

based upon data from such classified groups are influenced by aspects of the items which are supposed to be included and by other aspects of the items which are extraneous to the classification. This is extremely unfortunate, but our data do not lend themselves to any more precise handling.[9]

There is no way of knowing, from the data, on what basis one of our subjects decided he would like or dislike to be a florist, for example. It would undoubtedly prove to be an exceedingly difficult task to discover the real causes for such a choice. Since this cannot be done at the present time, we must proceed on the very faulty basis of *a priori* reasoning. For in assigning the item "florist" to the three groups above it is assumed that selling, being a retailer, and raising flowers were activities more or less in mind when our subjects decided whether they would like to be florists or not. Undoubtedly some thought of a florist as one who works hard or makes a large or a small income. But these and other similar classifications have not been made use of here because there were too few items that fitted them or because it was too difficult to draw the line between what should be included and what rejected.

The classification of interests employed here is given in Table 83, together with the percentage of likes at the three age levels in this study and the age levels of 25 and 55 years in the earlier study. This table has been condensed to 25 groups from an earlier table containing 31 groups. The correlations in Table 84 based on the earlier table depict the extent to which men at the three age levels agree in liking these groups or interests. The first six correlations, averaging .865, indicate high agreement between the interests of the three age levels, agreeing in this respect with Table 16 (p. 98). The seventh correlation of .09 makes clear that changes between 15 and 25 years are not associated with changes from 25 to 55 years. The last four correlations in the table indicate that changes in interests from one decade to another are unrelated to the amount of interest possessed at the beginning or end of the period. This is to be expected, since the general trend in liking is upward from 15 to 25 years and downward

[9] The factor-analysis technique might give more precise groupings; but who is willing to undertake such an analysis involving 400 items?

from 25 to 55 years, and since some interests increase and some decrease with age.

Significance of differences in Table 83.—The calculation of the standard error of the difference between two averages of a number

TABLE 83

CLASSIFICATION OF ITEMS WITH PERCENTAGE OF LIKES AT AGES 15, 25, AND 55 YEARS AND CHANGES IN LIKES BETWEEN 15 AND 25 AND ALSO 25 AND 55 YEARS

(Data from two different investigations included)

Classification of Interests	Present Investigation						*Change of Interests with Age* Investigation		
	N	Age 15	Age 25	Age 55	Age 25–15	Age 55–25	Age 25	Age 55	Age 55–25
Physical skill and daring	19	50.7	48 2	31.2	—2.5	—17.0	42.8	28.2	—14.6
People—desirable traits	13	47.3	63.3	61.5	16.0	—1.8	57.5	62.1	4.6
Amusements — noncultural, pursued alone or with a few	40	40.1	42.3	38.3	2.2	—4.0	36.2	31.7	—4.5
Working conditions	29	39.0	41.4	43.3	2.4	1.9	39.8	40.0	0.2
Possession of present abilities	25	34.8	48.8	52.9	14.0	4.1	...	...	....
Amusements—general cultural	13	34.7	50.0	52.0	15.3	2.0	49.2	41.6	7.6
Occupations—involving physical danger, out-of-doors, mechanical pursuits, athletics and travel	21	34.2	36.7	29.7	2.5	—7.0	29.0	19.6	—9.4
Linguistic—primarily reading	19	33.8	45.1	45.4	11 3	0.3	48.3	44.1	4.2
Dislike of change	21	33.6	29.0	36.0	—4.6	7.0	26.1	34.9	8.8
School subjects	36	31.2	45.6	41.8	14.4	—3.8	...	...	....
Amusements — noncultural, pursued with many persons	22	30.0	33.3	30.2	3.3	—3.1	30.6	23.3	—7.3
Influencing others—supervising	19	24.6	30.5	28.3	5.9	—2.2	35.8	29.8	—6.0
Influencing others—advising, instructing	19	23.3	36.9	32.0	13.6	—4.9	46.3	48.4	2.1
Occupations involving working with things	48	23.1	28.6	26.5	5.5	—2.1	23.8	20.3	—3.5
Occupations involving supervision of others	23	22.3	33.6	30.0	11.3	—3.6	27.0	21.2	—5.8
Occupations involving the handling of figures	20	21.7	29.7	28.9	8.1	—0.8	21.8	19.6	—2.2
People—unfortunates	13	15.3	20.0	22.6	4.7	2.6	16.7	19.8	3.1
Influencing others, selling others	12	14.6	24.4	23.6	9.8	—0.8	27.2	32.6	—3.6
Linguistic—primarily writing	23	14.6	28.9	21.9	14.3	—6.9	36.2	32.6	—3.6
Linguistic—primarily speaking	36	14.1	25.6	23.0	11.5	—2.6	32.0	28.0	—4.0
Occupations involving writing	9	13.8	28.9	18.7	15.1	—10.2	36.8	29.1	—7.7
Occupations involving service to people	14	13.2	22.3	20.9	9.1	—1.4	20.3	14.8	—5.5
Occupations involving instruction of others	13	10.3	23.2	19.5	12.9	—3.7	28.4	23.2	—5.2
People—undesirable traits	15	9.8	7.2	5.5	—2.6	—1.7	8.7	6.6	—2.1
Occupations involving selling	13	7.5	19.3	22.1	11.8	2.8	15.4	10.6	—4.8
Averages	..	26.8	34.6	32.3	7.8	—2.3	...	...	...

of items is not simple. On the basis of Truman Kelley's formulae discussed on pages 63 to 67 of *Change of Interests with Age*, the standard deviation of the difference between two averages for ages 25 and 55 when there are populations of 215 and 151, respectively, and when 47 items are involved, is 2.1 per cent and when 13 items are involved is 2.3 per cent. Accordingly differences of 7.0 or more between averages of items liked by 25- and 55-year-old men are statistically significant, having a critical ratio of 3.0 or more. The sigma of the difference of two averages representing 15- and 25-year-old men is smaller than 2.1 and 2.3, since the populations are larger, i.e., 472 and 215, respectively, instead of 215 and 151. Consequently differences of 6.0 or more between averages of items liked by 15- and 25-year-old men are to be considered as statistically significant. At best the calculations above are only a rough approximation, but they are sufficiently accurate for the use made of them. Great refinement in calculating standard errors of differences is unwarranted in the face of the unknown errors which have been introduced by classifying items as they have been done here.

TABLE 84

RANK-ORDER CORRELATIONS BETWEEN INTERESTS OF MEN AT THREE AGE LEVELS

(Data are 31 classes of interests instead of 25 classes appearing in Table 83)

15- and 25-year-olds, census sampling	.907
15- and 55-year-olds, census sampling	.812
25- and 55-year-olds, census sampling	.885
25- and 55-year-olds, eight occupation sampling	.934
25-year-olds, census vs. eight-occupation sampling	.847
55-year-olds, census vs. eight-occupation sampling	.810
Change from 15 to 25 vs. change from 25 to 55, census sampling	.092
15-year vs. change from 15 to 25, census sampling	−.192
15-year vs. change from 25 to 55, census sampling	−.270
25-year vs. change from 15 to 25, census sampling	.191
25-year vs. change from 25 to 55, census sampling	−.203

Interest in physical skill and daring.—We are all familiar with the fact that daredeviltry goes with youth. Table 83 gives us confirmation of this fact that 15-year-old boys like activities expressive of physical skill and daring more than any other type. On the average, 50.7 per cent of such boys like chopping wood, handling horses, snakes, boxing, performing sleight-of-hand tricks,

pursuing bandits in a sheriff's posse, playing baseball rather than watching it, driving an auto, hunting, climbing along the edge of a precipice, auto races, secret service man, explorer, aviator, and so on.

Interests in such activities drops slightly at age 25 (from 50.7 to 48.2 per cent) and from then on such interests wane considerably until at age 55 only 31.2 per cent say they like items expressing physical skill and daring. This decline of 17 per cent from age 25 to 55 is the greatest to be found with any type of interest. But even at age 55 this interest is only one per cent weaker than the average of all the groups in Table 83.

Reference to the table shows that more men like a given type of interest when that interest is presented in terms of activities typical of the interest than when it is presented in terms of occupations which presumably involve such activities. This is particularly true here, for 50.7 per cent of 15-year-old boys like activities symptomatic of physical skill and daring, but only 34.2 per cent on the average like occupations which necessitate physical skill and daring. An example would be "auto racer," liked by 39 per cent of 15-year-old boys. Instead of the very distinct drop in interest from 15 to 55 years in such activities there is only a slight decrease in liking occupations of this sort—a decrease from 34.2 per cent to 29.7 per cent. Although this final percentage of 29.7 is below the average for all types of interests in Table 83, it is second highest of all interests represented by occupations in the table, surpassed only by occupations involving supervision of people.

It is a matter of common observation that men do not avoid occupations involving danger and that they take little interest in safety devices safeguarding machinery. Possibly we have here an explanation of man's reluctance to co-operate in safety-first measures—he really enjoys the thrill that goes with danger; he takes a pride in working where an accident is possible, not because he wants accidents, but for the thrill of dodging them.

Interest in the peculiarities of people.—All the items describing peculiarities of people were subdivided into: (1) Unfortunates, (2) Primarily desirable traits, (3) Primarily undesirable traits, (4) Miscellaneous. In the earlier study the desirable group included items that were liked by at least 32 percent of 25-year-old

men in contrast to the undesirable group which contained items liked by less than 20 per cent of 25-year-old men. All questionable cases were thrown into the fourth group composed of teetotalers, people who do not believe in evolution, men who use perfume, talkative people, emotional people, socialists, people who chew gum, etc. This group is liked approximately as well as the unfortunates.

Fifteen-year-old boys like people with primarily desirable traits second best of all types of items, such as methodical people, independents in politics, religious, cautious, conservative, and thrifty people, optimists, and the like. Interest in such people rises from 47.3 per cent at 15 years to 63.3 per cent at 25 years and drops slightly to 61.5 per cent at 55 years of age. The increase of 16.0 per cent from 15 to 25 years of age is the second greatest to be found with any type of interest. Items of this type are liked best of all by men from 25 to 55 years of age.

Unfortunates are liked by 15.3 per cent at age 15, 20.0 per cent at age 25, and 22.6 per cent at age 55. Undesirables, on the other hand, are liked by only 9.8 per cent at age 15, 7.2 per cent at age 25, and 5.5 per cent at age 55. They are liked next to last of all types of items at age 15 and least of all at older ages.

Many persons, particularly authors and ministers, complained about the items relating to unfortunates. Judging from their comments they realized that they did not like such people but felt that they ought to like them. If they reacted as they felt, they were not the kind of people they wanted to be; if they recorded liking for such items, they were not telling the truth. It is possible that a considerable number recorded indifference as to "unfortunates" in order to dodge a mental conflict. Actually a half of the three age groups marked indifference to the unfortunate items and only a third made this response to undesirable people.

People with desirable traits are on the whole most liked of all types of interests, and people with undesirable traits are on the whole least liked. Evidently men can be more unanimous in their likes and dislikes toward kinds of people than toward other groups of items. This unanimity is almost as characterisitc of 15-year-old boys as it is at later age levels.

Interest in games, amusements, recreation.—A double classi-

fication has been employed here with reference to amusements. The items have been classified on the basis of cultural and noncultural activities, also as to whether they are pursued usually alone, with a few persons, or with many persons.

Noncultural amusements pursued alone or with only a few persons constitute the fourth most-liked group of items by 15-year-old boys. Forty per cent on the average like chopping wood, cabinet making, *Popular Mechanics*, detective stories, repairing an auto rather than driving, pet canaries, pet monkey, snakes, collecting postage stamps, animal zoos, fishing, chess, billiards, fortune tellers, golf, etc. The percentage of liking these things rises to 42.3 at age 25 and drops to 38.3 per cent at 55 years of age—a very stable interest throughout life.

Amusements of a cultural aspect are sixth strongest with 15-year-old boys, 34.7 per cent liking such items as nature study, *National Geographic Magazine*, *Atlantic Monthly*, poetry, art galleries, museums, educational movies, symphony concerts. Such interests rise in liking from 34.7 per cent to 50.0 per cent at age 25 and to 52.0 per cent at 55 years of age. They are liked second best of all our types of interest from 25 to 55 years of age.

In contrast to these two groups of amusements which are liked so well there is the third group of noncultural forms of recreation pursued with many persons. These are liked by 30.0 per cent of 15-year-old boys, by 33.3 per cent at 25 years, and by 30.2 per cent at 55 years, which means they are liked considerably less at all ages than recreations of a cultural aspect and less at 15 years of age than the noncultural group of recreations pursued alone or with a few persons. It is easy to understand why only a small minority of boys like making a speech, conventions, auctions, drilling in a company, belonging to many societies vs. a few societies, smokers, organizing a play, and full-dress affairs; but it is surprising to find that older men also like the following better than 15-year-old boys: musical comedy, vaudeville, picnics, and excursions—even though these four forms of recreation are liked by over fifty per cent of the younger group.

Recreations with a few persons are liked by 40.6 per cent of 15-year-old boys in contrast to 35.7 per cent who like recreation primarily alone and 32.3 per cent who like recreation pursued

with many persons. This preference for a small group still holds good at age 25. At age 55 there is no difference in liking recreations whether pursued alone or with a few persons, but both of these are preferred by 5 per cent to recreations pursued with many persons. Males are seemingly not so gregarious as some authorities have maintained.

McGehee[10] reports that 32 per cent of Grade VIII boys had social hobbies as compared with 40 per cent who had nonsocial hobbies. (Data for girls were, respectively, 31 and 34 per cent.) These percentages agree surprisingly well with our data.

Working conditions.—There are 29 items concerned with working conditions aside from those in Part VI of the revised *Vocational Interest Blank.* Since there seems to be no way of classifying the 29 items, they are considered together.

At all age levels men very distinctly prefer work which interests them with modest income to work which does not interest them with large income; they prefer working for themselves in preference to carrying out the program of a superior who is respected; and they prefer working for themselves in a small business to working in a large corporation with little chance of becoming president until age of 55 years. They also prefer working outside instead of inside, quality instead of quantity, physical instead of mental work, being a chauffeur rather than a chef, and being a motorman rather than a conductor.

The surprising thing in this connection is that in almost every case the 15-year-old boy has already reached the attitude possessed by older men regarding working conditions. The same conclusion is evident from Table 85, which gives the data concerning three of the four groups of items in Part VI of the blank.

There are only a few changes in interest with age in this table. "Creating a new artistic effect in a machine" drops from fifth to tenth place when 15- and 25-year-old men are compared with 55-year-old men. Similarly older men are not so interested in "opportunity for promotion," which is, of course, quite understandable. Fifteen-year-old boys rank chairman of program committee fifth in interest instead of ninth. These are the only significant changes in the table.

[10] W. McGehee, "Changes in Interest with Changes in Grade Status of Elementary School Children," *Journal of Educational Psychology* (1941), **32**, 151–56.

TABLE 85

ORDER OF PREFERENCE OF CERTAIN WORKING CONDITIONS*

Items Liked	Percentage Rated as Most Enjoyed			Rank Orders		
	Age 15	Age 25	Age 55	Age 15	Age 25	Age 55
Group I						
Operate (manipulate) the new machine	68	51	58	1	1	1
Develop the theory of operation of a new machine	52	49	46	2	2	3
Discover an improvement in the design of the machine	46	43	47	3	3	2
Teach others the use of the machine	36	38	29	4	4	5½
Create a new artistic effect	26	27	7	5	5½	10
Supervise the manufacture of the machine	22	27	34	6	5½	4
Sell the machine	17	16	29	7	9	5½
Determine the cost of operation of the machine	13	18	20	8	7½	7
Prepare the advertising for the machine	9	15	12	9	10	9
Interest the public in the machine through public addresses	8	18	17	10	7½	8
Group II						
Opportunity for promotion	65	66	37	1	1	5
Steadiness and permanence of work	51	48	55	2	2	1
Salary received for work	50	35	42	3	4	3
Freedom in working out one's own methods of doing the work	33	32	40	4	5	4
Opportunity to make use of all of one's knowledge and experience	28	37	43	5	3	2
Courteous treatment from superiors	22	18	18	6	7	8
Opportunity to ask questions and to consult about difficulties	17	21	19	7	6	7
Opportunity to understand just how one's superior expects work to be done	14	11	9	8	10	10
Certainty one's work will be judged by fair standards	11	12	23	9	9	6
Co-workers—congenial, competent, and adequate in number	8	16	16	10	8	9
Group III						
President of a society or club	52	60	49	1	1	1
Chairman, entertainment committee	42	39	32	2	2½	4
Member	38	39	47	3	2½	2
Treasurer	29	32	32	4	4	4
Chairman, program committee	27	18	18	5	9	9
Chairman, educational committee	21	25	22	7	5	8
Chairman, membership committee	21	23	23	7	6½	7
Chairman, arrangement committee	21	17	25	7	10	6
Secretary	20	22	32	9	8	4
Chairman, publicity committee	14	23	15	10	6½	10

* The instructions were to indicate three of the ten items in a group that would be enjoyed most by checking them in the first column; similarly to indicate the three items that would be enjoyed least by checking them in the third column; and to check the remaining four items in the second column.

Possession of present abilities.—The data on present abilities and characteristics have reference not to what is liked and disliked but to whether the individual has or does not have the given trait, indicated on the blank by "Yes," "Not sure," and "No." The results presented in Table 86 give the percentage of "Yes" responses. The items were originally subdivided under (1) involving leadership, supervisory ability, (2) as an individual worker, and (3) miscellaneous. The differences between the three subdivisions are statistically insignificant, and in consequence the three subgroups were discarded. The averages for all 39 items are 34.8 per cent of "Yes" replies at age 15, 48.8 per cent at age 25, and 52.9 per cent at age 55. The "No" replies are less than the "Yes" replies, with differences between the two of 16.5, 33.6, and 37.5 per cent at the three age levels, respectively. Evidently older men are somewhat surer that they possess desirable traits[11] than are younger men, particularly 15-year-olds.

The more a 15-year-old boy believes he possesses a desirable trait the greater is the increase in such a belief by 25-year-old men (see Table 86). Thus the six traits possessed on the average by 57.0 per cent of 15-year-old boys are possessed by 77.2 per cent of 25-year-old men, an increase of 20.2 per cent. The next fifteen traits possessed by 37.5 per cent of 15-year-olds increase by only 17.1 per cent to age 25, and the last sixteen traits possessed by 23.7 per cent of 15-year-olds increase by only 14.0 per cent to age 25. The conclusion stated above is supported by the following three correlations:

Possession of trait at 15 and 25 years of age....	.86
Possession of trait at 15 and 55 years of age....	.74
Possession of trait at 25 and 55 years of age....	.92

It seems well-nigh impossible to group the items in Table 86 and thereby summarize the data. One point is clear, however: The items which are least often responded to with "Yes" (the third group) pertain more often to (*a*) specific actions, which can be rather easily checked as to the accuracy of the claim, and (*b*) to selling and supervising activities than do the items in the second and first groups.

[11] The items have been recorded so that "Yes" in each case refers to a desirable trait, thus "Feelings easily hurt" has been replaced by "Feelings rarely hurt."

TABLE 86

EXTENT TO WHICH MEN REPORT THEY POSSESS DESIRABLE TRAITS

Desirable Traits	Percentage of "Yes" Responses		
	Age 15	Age 25	Age 55
Accept just criticism without getting sore	64	82	72
Do not get "rattled" easily	60	62	62
Discuss my ideals with others	57	74	68
Can carry out plans assigned by other people	55	81	78
Am inclined to keep silent (reticent) in confidential affairs	54	81	76
Am approachable	52	83	77
Average of 6 items	57.0	77.2	72.2
Win friends easily	49	65	69
Usually drive myself steadily (do not work by fits and starts)	46	68	72
Win confidence and loyalty	43	72	80
Carefully consider feelings of others	41	62	50
Practically never borrow money for personal use	40	61	68
Can discriminate between more or less important matters	40	72	81
Am always on time with my work	39	66	71
Am quite sure of myself	36	46	56
Able to meet emergencies quickly and effectively	36	54	54
Remember faces, names, and incidents better than the average person	35	33	31
Smooth out tangles and disagreements between people	35	53	56
Can correct others without giving offense	35	55	53
Best-liked friends are superior to me in ability	34	41	38
Tell jokes well	33	19	28
Plan my work in detail	32	64	60
Stimulate the ambition of my associates	32	47	49
Show firmness without being easy	32	51	59
Average of 15 items	37.5	54.6	57.4
Usually liven up the group on a dull day	29	33	36
Handle complaints without getting irritated	28	33	43
Enter into situation and enthusiastically carry out program	28	49	50
Rarely loan money to acquaintances	27	39	40
Have mechanical ingenuity (inventiveness)	27	34	42
When caught in a mistake practically never make excuses	15	27	33
Have good judgment in appraising values	27	40	50
Feelings rarely hurt	26	17	21
Usually start activities of my group	24	36	50
Put drive into the organization	23	29	44
Usually get other people to do what I want done	23	43	55
Never make wagers	20	30	53
Follow up subordinates effectively	19	40	56
My advice sought by many	18	18	30
Can write a concise, well-organized report	17	33	40
Have more than my share of novel ideas	16	23	20
Average of 16 items	23.7	32.1	40.9
Average of all 39 items	34.8	48.8	52.9

Linguistic activities.—All the items on the blank that seemingly had anything to do with linguistic activities have been brought together into three groups, as follows: (1) Speaking, (2) Writing, and (3) Reading. There appears to be no particular difference between the first two, being liked at age 15 by about fourteen per cent, at age 25 by about twenty-seven per cent, and at age 55 by about twenty-two per cent. Linguistic activities involving reading are liked about twice as well—the percentages are 33.8 at age 15, 45.1 at age 25, and 45.4 at age 55. All three groups of items increase in liking by about thirteen per cent from age 15 to 25. This is one of the most noticeable changes in interest during this decade. Occupations involving writing are liked just about the same as items representative of the activity of writing. This is one case where the occupations are not liked distinctly less than the activities which the occupations seemingly involve.

Dislike of change, interference with established habits.—Examples of this group of interests are: dislike of continually changing activities, work in one place versus changing from place to place, methodical work, playing safe versus taking a chance, steadiness and permanence of work, definite salary versus commission. In addition there are included certain items which describe individuals who represent change: dislike of Bolshevists, socialists, people who always agree with you, conservative people, etc. Older men dislike change more than younger men—the difference between 55 and 25 years is statistically significant but the difference between 55 and 15 years is not, for 25-year-old men dislike change the least. See Table 83.

Having data for only 25- and 55-year-old men in 1931, the writer explained the greater dislike for change of older men on the ground that

> doing new things necessitates the developing of new habits, usually at the expense of old ones. This is easy in youth because the existing habits are not too strongly established and there is surplus energy for the purpose. But later in life the reverse is the case, for old habits are well established and can be broken only with genuine effort, and there is less energy available for this.[12]

Apparently this is not the explanation, since both boys and old men are less interested in change than 25-year-olds.

[12] *Change of Interests with Age* (1931), p. 74.

School subjects.—School subjects are liked better than the average in Table 83 at all three age levels. This statement holds true for subjects encountered in grammar school, high school, and college, with the exception of college subjects by 15-year-old boys (see Table 77). It is easy to understand why the college subjects of psychology, economics, and philosophy should be liked better by twenty or more per cent at 25 years than at 15 years. But the fact that the grammar school subjects of spelling, English composition, literature, history, and geography also increase in interest by equal amounts during this decade cannot be attributed entirely to increase of familiarity. Older men believe they like school subjects to a greater extent than they were willing to admit while in school. Distance may lend enchantment here. Or the explanation may be in the fact that it is the socially acceptable thing among schoolboys not to like school subjects.

Influencing others.—Items relative to influencing people have been subdivided, as follows:

	Likes of 15-Year-Olds	Change from 15 to 25
1. All items, excepting occupational items		
a) Supervising people	24.6	5.9
b) Advising, instructing, influencing people	23.3	13.6
c) Selling	14.6	9.8
2. Occupational items		
a) Supervising people	22.3	11.3
b) Rendering service to people	13.2	9.1
c) Advising, instructing, influencing people	10.3	12.9
d) Selling	7.5	11.8

With one exception (subgroup 1*b* at 25 years) all these items are liked less than the average for all types in Table 83 at all three age levels; subgroup 2*d* is liked least of all, and subgroup 2*c* third least of all at 15 years of age.

Supervising people is most-liked of the four subgroups, rendering service to people second, advising, instructing, and influencing third, and selling least of all. This is true at age 15; at older ages, the functions of advising, instructing, and influencing is liked best; but this does not hold true for occupations representative of this function.

Here again the four functions are liked less when expressed in terms of occupations representative of them than when expressed in terms of the activities themselves.

The change in liking these functions from 15 to 25 years averages about eleven per cent, which is slightly more than for the average of all the kinds of items in Table 83. But this does not bring any of this group except 1*b* up to the average of all groups at 25 years of age.

Interest in occupations involving working with things.—Forty-eight occupational items are grouped here and subdivided as follows: (*a*) as skilled workman, (*b*) as retail salesman, (*c*) as artist, (*d*) as medical man, (*e*) as farmer, (*f*) as scientist, and (*g*) as supervisor. All told, the items are liked by 23.1 per cent of 15-year-old boys, by 28.6 per cent of 25-year-old men, and by 26.5 per cent of 55-year-old men. These percentages are less than the averages for all types in Table 83.

It is often said that men like things better than people and women the reverse. There is little justification for the sweeping statement here.[18] People with desirable traits are liked by 47.3 per cent of 15-year-olds and by 63.3 per cent of 25-year-olds—over twice as well as these occupations involving working with things. On the other hand, people with undesirable traits are liked, respectively, by 9.8 and 7.2 per cent at the two age levels, which means they are liked less than half as well as occupations involving working with things. As far as men are concerned, things are less liked than certain kinds of people and better liked than other kinds of people.

There is slight change with age in liking the 48 occupational items—an increase of 5.5 per cent from 15 to 25 years, and a decrease of 2.1 per cent from 25 to 55 years—not statistically significant differences.

Interest in occupations involving the handling of figures.—Grouped here are occupations such as bookkeeper, bank teller, office clerk, stock broker, and so on; also occupations involving statistical calculations such as astronomer, mechanical engineer, architect, statistician, laboratory technician, etc. Only 21.7 per cent of 15-year-old boys like these items, a liking which increases to 29.7 per cent at age 25 and drops to 28.9 per cent at age 55. Handling figures is liked about four per cent less than the average as given in Table 83 at each of the three age levels.

[18] See further discussion of the point on p. 244, above.

CHANGES IN INTERESTS BETWEEN 25 AND 55 YEARS OF AGE

For consideration of this topic there are available two entirely different sets of data—the first based on 215 25-year-old men and 151 55-year-old men (Census group), and the second based on 604 20–29-year-old men and 396 50–59-year-old men, representative equally of the eight occupations of engineer, lawyer, life insurance salesman, minister, physician, schoolman, writer, and Y.M.C.A. secretary.[14] For convenience the two sets of data will be referred to as the "Census" group and the "Age Study" group. A summary of the data of both groups is presented in Table 83.

Perusal of this table makes clear that there is good agreement, on the whole, between both sets of figures. The rank-order correlations between columns 6 and 9, pertaining to change in interests between ages 25 and 55 years, is .69.

In only five cases out of 23 groups of items in Table 83 is there a statistically significant change in the Census data between 25 and 55 years of age.[15] Four of these cases have significant changes in the Age Study data. These few cases are in striking contrast to the sixteen significant changes between 15 and 25 years of age and emphasize again the fact that changes in interests are relatively slight in the decades after 25 years of age.

The greatest change in interests during this period pertains to physical skill and daring. Older men do not like such activities as much as 25-year-old men do. The decrease in liking amounts to 17 per cent for the Census data (14.6 per cent for the Age Study data). Occupations suggestive of such activities also decrease in liking 7 per cent (9.4 per cent in the Age Study).

The second greatest change pertains to occupations involving writing, such as reporter of sporting pages, advertiser, foreign correspondent, author of a technical book, poet, and the like. The decreases in liking are 10.2 and 7.7 per cent, respectively. This conclusion is supported by the change in items, other than occupational, involving written linguistic activities. The decrease in liking is 6.9 per cent for the Census group and the nonstatistically significant decrease of 3.6 per cent for the Age Study group.

[14] These are part of the data upon which *Change of Interests with Age* is based.

[15] Differences of 6 per cent are accepted as statistically significant.

The third greatest change is registered by items suggesting change or interference with established habits or customs. Thorndike[16] reports evidence supporting this conclusion and summarizes it by saying that "adults are proverbially less ready to adopt new ways, even to try new ways, than adolescents." From the practical point of view of employing older men, we do not know whether Thorndike's finding of relatively slight diminution in ability to learn from 25 to 55 is more or less significant than our joint finding of increase in disinclination to change. Further research is greatly needed at this point.[17]

These are all the changes in interests between 25 and 55 years of age that are significant according to both sets of data. In the case of the Age Study alone, amusements of a cultural nature increase in liking 7.6 per cent (only 2.0 per cent with the Census group), amusements of a noncultural nature pursued alone or with a few persons decrease 7.3 per cent in liking (only 3.1 per cent with the Census group), and activities involving the supervision of others decrease 6.0 per cent (only 2.2 per cent with the Census group).

The primary conclusion regarding interests of men between 25 and 55 years of age is that they change very little. When these slight differences over thirty years are contrasted with the differences to be found among occupational groups, or between men and women, or between unskilled and professional men, it must be realized that age and the experience that goes with age change an adult man's interests very little. At 25 years of age he is largely what he is going to be and even at 20 years of age he has acquired pretty much the interests he will have throughout life.[18]

[16] E. L. Thorndike, *Adult Learning* (The Macmillan Company, 1928), p. 174.

[17] *Ibid.*, p. 147. A decrease of 13 to 15 per cent between ages 20–25 and age 42.

[18] Rosander tested 13,000 males and females ranging in age from 16 to 24 on seven social attitudes and found little or no change in attitude for both sexes on five scales and distinct change on three scales. The latter showed increase in drinking and decrease in attendance at church and willingness to go to war. It is significant that 16-year-old boys and girls have practically the same attitude on five social problems as those who are older up to 24 years of age. Many attitudes as well as interests are well established by 16 years of age. A. C. Rosander, "Age and Sex Patterns of Social Attitudes," *Journal of Educational Psychology* (1939), **30**, 481–96.

Chapter 14. Interest Factors

INTRODUCTION

Many psychological studies are devoted today to the discovery of basic psychological traits. Are there primary interests as well as primary mental abilities? Do the 400 items on the interest test represent that number of distinct interests or do they represent a far fewer number of basic interests?

The first part of this chapter is concerned primarily with the use of factor analysis in attempting to formulate basic interests. The last section reviews other procedures and indicates the probable relationships between interests and other measures of personality.

Purpose of factor analysis.—Factor analysis is used first of all to discover if there are underlying, basic, functional unities (factors, or traits, or whatever they may be called) in terms of which a larger number of tests may be expressed; second, to identify these functional unities; and, third, to develop tests which will measure such unities, so that a smaller number of fundamental tests may be employed in the place of a larger number which measure a mixture of elements. Kelley and Thurstone, for example, believe that such functional unities exist. Thomson, on the other hand, does not believe that human abilities act in unique constellations which can be identified. And Burks[1] shows that personality is more likely to be made up of a multitude of complexly interrelated dispositions than of a few discrete traits and abilities. As far as interests are concerned, the writer inclines toward this last point of view. Yet it is entirely possible that interests may be reduced to a few fundamental types.

Through factor analysis it was shown in chapter 8 that four or

[1] B. S. Burks, "Personality Theories in Relation to Measurement," *Journal of Social Psychology* (1936), 7, 140.

five factors may express almost all of the occupational interests, that is, that occupations may be located in four- or five-dimensional space and on that basis they may be classified into groups. That is very useful. But such occupational groups are quite distinct from functional unities, for it is very evident that each group is representative in varying degree of all the factors.

The question naturally arises as to the nature of these four or five factors—are they really functional unities or are they merely mathematical co-ordinates in terms of which the occupations may be located in space? If the latter, they have served their purpose in identifying occupational groups and need be considered no further. If the former, then they should be identified and interest tests developed to measure them directly. Not that such tests would necessarily enable us to measure occupations any better or to identify the occupation to which a man belongs any better, but that such tests should lead to a better understanding of the nature of interests and so to the development of better interest tests. Not knowing at the present time which items contribute to the various "factors," we are not in a position to add or subtract items from the test so that all "factors" will be adequately represented.

The following pages report our findings as to the nature of the factors which are disclosed by factor analysis. It is pointed out that the factors may be interpreted (i.e., given a name) in many ways. With so many different sets of names for the factors available, extensive investigations should be prosecuted in order to determine which set is best.

THURSTONE'S IDENTIFICATION OF FACTORS

Thurstone believes that it is possible to guess the psychological factors or traits when the original factors have been properly rotated. Thus he named the four factors which he found in his factor analysis of our data "science," "language," "people," and "business." This was done by inspecting the occupations which have plus and negative loadings on each factor and guessing what the factor means. In discussing his naming of the four interest factors in his factor analysis of our data he says:

> This matter of naming the factors is entirely extraneous to the statistical analysis. The statistical work may be correct while considerable argument might conceivably be made about the naming of the factors. In naming

the factors we proceed as follows. We inspect the column of first factor loadings with reference to the positive values. We find then that the factor has high positive loadings in the following professions, namely, chemistry, engineering, psychology, architecture, agriculture and medicine. We also find that the following professions have strong negative loadings (dislike) for the first factor, namely, advertising, life insurance selling, real estate selling. It seemed to the writer that scientific interest is probably a factor that would differentiate the above professions in the manner shown. Therefore the first factor is called tentatively an interest in science.[2]

The names given by Thurstone to his four factors seem quite plausible. They do not, however, fit so well the factors extracted in later analyses based on a larger number of occupations. In order to compare his findings, which were based on unrotated factor loadings, with ours it is preferable to use here our unrotated factor loadings from the fifth analysis. (Rotated factors are considered in the next section.)

Since Thurstone's first factor correlates .82 with our first factor (see Table 31, p. 144), it would appear that they are quite similar. In both cases the scientific pursuits have high loadings; but also do printer (fourth highest), musician, minister, Y.M.C.A. physical director, and policeman in our findings (see Table 30, p. 142). "Science" is thus not a very satisfactory name for our first factor. Thurstone's first factor also correlates —.86 with our second factor. Here the scientific professions have low negative factor-two loadings, but so also do artist, farmer, and carpenter. If any of our factors is to be called "science," it would be factor two. A better name might be "dealing with people vs. things," for positive factor-two loadings go with occupations dealing with people (with the exceptions of accountant, banker, and office worker) and negative loadings go with occupations dealing with things.

Thurstone's factor two, called "language," correlates —.96 with our third factor. In agreement with this naming for our third factor is the fact that lawyer, journalist, and advertiser have loadings lower than —.76 and that the sales group of life insurance salesman, realtor, and sales manager range between —.28 and .06. But one would hardly classify artist, psychologist, physician,

[2] L. L. Thurstone, "A Multiple Factor Study of Vocational Interests," *Personnel Journal* (1931), **10**, 202.

and architect as linguistic; yet their loadings range between —.45 and —.76. At the other extreme are policeman, accountant, office worker, purchasing agent, production manager, and carpenter, ranging between .64 and .73, who might be considered as non-linguistic. All in all there is a general drift toward language as one goes from plus to negative loadings in factor three, but there are some real exceptions to this classification.

Thurstone's third factor, called "people," correlates only .63 with our second factor. As just pointed out, our second factor might be named "people vs. things." His fourth factor, called "business," correlates —.75 with our fourth factor and —.74 with our first factor. This name was based on the fact that realtor, certified public accountant, life insurance salesman, lawyer, and purchasing agent had loadings between .58 and .44 and that these included all the business occupations, except perhaps advertising (.22), that were involved in his analysis. These five occupations average —.37 on our first factor and —.40 on our fourth factor. The other business occupations which were included in our fifth analysis and not in Thurstone's analysis and have minus loadings on our fourth factor are president, sales manager, advertising man, office man, accountant, production manager, personnel manager, and engineer. These seven average —.06 on our first factor and —.42 on our fourth factor. The twelve constitute all the occupations that might be called business except banker. Combined they average —.19 on the first factor and —.41 on the fourth factor. Our fourth factor might then be called "business" if it must have a name. (When business occupations average —.41 it means that only one-sixth, $.41^2$, of their total variance is attributable to this factor. It would really seem that the best guess would be something other than business, since that cannot be a major consideration.)

Thurstone's terminology might then be applied to our fifth factor analysis—our third factor would then be called "language," our fourth factor "business," and our second factor "people vs. things"; or our first factor could be called "science" and our second factor "people." But to do this means ignoring some striking exceptions. At best his terminology provides us with some interesting hypotheses which should be investigated further.

How many factors?—Thurstone extracted only four factors in his factor analysis of our correlational data, whereas we have extracted five factors. How many factors should be considered?

There seems to be as yet no method by which this question can be answered definitely. After taking into account certain considerations one must still exercise judgment in determining how many factors are to be recognized.

If the correlations between variables as originally computed are compared with the correlations calculated from the extracted factor loadings we should be content with differences between the two sets of correlations which approach the probable error of the correlations. The probable errors of such differences, based on a random sampling of 103 cases among the correlations in Table 193 (facing p. 716), the major portion of which forms the matrix for the fifth analysis, are as follows:

When first factor loading only is used	.276
When first and second loadings only are used	.161
When first to third loadings are used	.080
When first to fourth loadings are used	.043
When all five loadings are used	.028

Since the probable error of the median coefficient in the table, disregarding signs, is .035, it would appear that four factors are sufficient and the fifth is questionable.[8]

The average communality for all five factors on 36 scales is .842. This is slightly less than the average reliability of these scales (.887). The use of only four factors would give a larger difference between communality and reliability, but we have no way of knowing how much variance is attributable to specific factors.

Figures 11 and 12 (both on page 154), make clear that with the use of the rotated factors 2_4 and 5_2, which have the least variance of all five factors, the occupational groups are all depicted as definite clusters although there is considerable overlapping among

[8] The percentage of residuals after four and five factors have been extracted are as follows:

Within the range ±.03	Fourth, 57 per cent;	Fifth, 71 per cent
Within the range ±.05	Fourth, 74 per cent;	Fifth, 87 per cent
Above .09 and below −.09	Fourth, 9 per cent;	Fifth, 3 per cent

See also the footnote on p. 144.

them. If these two minor factors were representative mainly of chance errors the groups should not be so well delineated. In each analysis made by us the fifth factor contributes considerably to the total variance of the certified public accountant scale, which has apparently some sort of interest not present in other scales. This is also true if Thurstone's four factors are extended to five.

Apparently it remains a matter of judgment whether four or five factors should be employed, and the fifth factor could be eliminated without much loss.

IDENTIFICATION OF FACTORS THROUGH ROTATION OF AXES

Below are listed the occupations which have high or low loadings (i.e., above .40 and below —.40) on the five factors after rotation.[4]

Factor I_4	.922 Architect	—.477 Personnel
	.909 Physician	—.532 Y. secretary
	.896 Artist	—.532 Life insurance
	.820 Physicist	—.546 Real estate
	.806 Dentist	—.579 Social science teacher
	.774 Psychologist	—.596 Purchasing agent
	.751 Chemist	—.654 Accountant
	.745 Mathematician	—.657 Sales manager
	.594 Journalist	—.791 Banker
	.583 Engineer	—.800 Office manager
	.447 Musician	
Factor II_4	.732 C.P.A.	—.405 Farmer
	.428 Accountant	
Factor III_2	.876 Carpenter	—.456 Sales manager
	.852 Mathematics-science teacher	—.608 Real estate
		—.675 Life insurance salesman
	.826 Policeman	—.715 Journalism
	.761 Farmer	—.784 Occupational level
	.735 Printer	—.825 Lawyer
	.735 MF	—.848 Advertising man
	.681 Production manager	
	.605 Engineer	
	.543 Chemist	
	.423 Accountant	

[4] Factor loadings after rotation are given in Table 33, p. 150. They are shown diagrammatically in Figures 7 to 12.

Factor IV_2	.873	Minister	−.462	Engineer
	.756	Social science teacher	−.470	MF
	.727	School superintendent	−.554	Production manager
	.719	Musician	−.607	Purchasing agent
	.709	Y.M.C.A. secretary	−.748	President
	.706	Y. physical director		
Factor V_2	.485	Personnel	−.442	Mathematician
	.441	Sales manager		

On the basis of these data we may call factor I_4 "Science," since all scientific pursuits considered here have high loadings on it. It is not quite clear, however, why artist, journalist, and musician should also have high loadings in "science." Since factor II_4 has only three significant loadings, it had better remain unnamed. Or, if preferred, it can be called "C.P.A." since all our studies to date indicate the C.P.A. has some interest peculiar to himself. Factor III_2 might be called "Things vs. People" except that policeman with a loading of .826 can hardly be thought of as working with things instead of people and journalists and advertising men are not peculiarly noted for dealing with people as their low loadings would suggest. Possibly a better name for III_2 would be "Language," since the occupations with negative loadings characteristically employ language whereas the occupations with positive loadings do not. Factor IV_2 clearly typifies our Occupational Group V—"working with people for their presumed good." This type of interest in people is different from that typified by the occupations with low loadings in Factor III_2. Hence a distinction must be made between two kinds of interest in people. Factor V_2 has only three significant loadings. No name suggests itself for this factor.

Accordingly, after rotation of axes there is some support for the names originally given by Thurstone to the four factors he found. "Science" can still be justified, with reservations, for the rotated factor I_4. "Language" can be used to name factor III_2 when reference is had to the negative factor loadings instead of the positive; or, as stated above, III_2 may be designated "Things vs. People." "People" can be applied to the rotated factor IV_2 if we have in mind Occupational Group V and not Groups IX, X, and XI. But there is no factor left to which the name "business" can be applied.

J. M. Brewer, basing his conclusions more upon our second factor analysis than upon Thurstone's, named the four factors: "scientific," "accounting," "competitive," and "humanitarian." Later he renamed the second "orderly, systematic" and the fourth "humane." His classification fits our data better than Thurstone's. All this is mentioned here because it emphasizes that two somewhat different sets of names have been assigned to the same factors. It is more than likely that still other names can be applied, which is only another way of saying that naming factors is as yet a very unscientific procedure.[5]

Factors as co-ordinates.—It is possible that the difficulty in analyzing factors arises because of the way in which occupational scales have been constructed. It is certainly possible that if the original data were worked up in some way not yet employed factor analysis would give us more clearly delineated basic interests. We have no reason for saying this—yet it is a possibility. But, as matters stand, our naming cannot be said to be satisfactory.

The next step, after guessing names for the factors, is to demonstrate experimentally that the naming is justified. For, after all, the naming is merely a process of setting up hypotheses as to the nature of the factors, and only after the hypotheses have been established can the names be accepted. The names that have been suggested, and quite likely other names which will occur, afford an excellent basis for experimentation. All this remains to be done.

Because the writer has become quite skeptical over the possibility of finding a few interest factors which will explain all interests, he has addressed himself to the related but much simpler problem of ascertaining which set of co-ordinates is the most meaningful to employ in expressing the relationships among occupations.

The writer has determined more than a dozen different sets of these co-ordinates in terms of which the occupations may be fairly well located on the surface of a sphere. In all these cases the groups

[5] It is of interest that before factor analysis was known, Mills, as a result of experience in industrial employment, classified interests into the four groups of ideas, men, things, and symbols. See J. Mills, "Engineering Aptitudes, An Interviewer's Method of Determining Basic Aptitudes of Engineering Graduates," *Journal of Personnel Research* (1924–25), **3**, 197–206.

Names applied to factors obtained from the women's scales are considered on page 164, above.

of occupations are properly differentiated. Why shouldn't they be? Once the intercorrelations are calculated from the test scores the relationships between every occupation and every other occupation are established and any set of good co-ordinates will merely reveal the relationships set forth by the intercorrelations. The situation is analogous to the relationships between San Francisco, New York, and New Orleans. In terms of any set of three co-ordinates at right angles to each other, these three cities can be located, as can all other cities on the earth's surface. Each set of co-ordinates will have different "factor loadings" for the three cities, but in every case the three cities will remain in the same relationship to each other.

In addition to the co-ordinates supplied by factor analysis it is possible to use occupational scales as co-ordinates. It is also possible to use the three special scales of IM, MF, and OL as co-ordinates. What is the significance, or value, of these three kinds of co-ordinates in depicting the relationships among occupations?

OCCUPATIONAL SCALES USED AS CO-ORDINATES

Journalist, realtor, and city school superintendent correlate zero (within ± 10) of each other. These three occupational scales constitute good co-ordinates by which all occupations may be located on a sphere. The resulting diagrams are not reproduced here; with their use the occupational groups are very well differentiated. Correlations between occupations based on the three co-ordinates differ on the average by .083 from the calculated correlations[6] in Table 193 (facing p. 716). The three co-ordinates possess definite meaning—Occupational Groups I, II, and IV have interests correlating negatively with realtor; Group V has interests which correlate positively with city school superintendent; etc.[7]

[6] A difference of .083 represents as good a fit as is obtained from the first three factors from factor analysis. See p. 318, above.

[7] In addition to this triplet of occupations there are twelve other triplets which can be similarly employed as orthogonal co-ordinates. They are: dentist, production manager, Y physical director; mathematician, minister, policeman; mathematician, minister, certified public accountant; physicist, minister, policeman; physicist, minister, certified public accountant, chemist, journalist, president; production manager, Y. physical director, sales manager; forest service, purchasing agent, personnel manager; forest service, office man, minister; office man, minister, certified public accountant; banker, personnel manager, lawyer; personnel manager, musician, lawyer. Unfortu-

IM, MF, AND OL USED AS CO-ORDINATES

In 1934 and again in 1936 the writer called attention to the relationships between the factors resulting from factor analysis and the two special scales—interest-maturity and masculinity-feminity—and intelligence.[8]

Certain data regarding IM, MF, and, in addition, OL, are given in Table 87. The first three columns give the mean standard score for each occupation on the three special scales of IM, MF, and OL. The next four columns of the table give the correlations between the occupations and the three special scales and also intelligence[9] based on the scores of 285 college seniors. The factor of intelligence has been dropped from consideration because its total variance on five factors in the third factor analysis amounted to only .28 and in the fourth analysis to only .20. This explains in part at least the low correlations (range from .38 to —.26) beween intelligence and occupational interests as given in column 7 of Table 87.

The two measures of IM, MF, and OL in Table 87 agree very closely, for the several rank-order correlations range between .854 and .987. This is gratifying, since different blanks and different procedures were used in the two sets of calculations.

Relation of IM, MF, and OL to factor loadings.—The rank-order correlations between columns 4 to 7 in Table 87, and the factor loadings from the fifth factor analysis are given in Table 88. Before rotation, interest maturity is associated with factor II, MF with factor III, and OL with the three factors I, III, and IV about equally. After rotation of axes, IM is associated with factor I_4 and MF and OL with factor III_2. Since in the latter case one scale correlates above .80 and the other below —.80, one would expect that MF and OL would correlate distinctly negatively

nately, no combination of four scales is available all of which are orthogonal to one another. Journalist, realtor, and city school superintendent correlate less than ±10 with each other; president correlates .08 with journalist, .42 with realtor, and —.39 with city school superintendent. This is the best combination of four scales that we have noted.

[8] E. K. Strong, Jr., "Classification of Occupations by Interests," *Personnel Journal* (1934), **12**, 301–13, and "Interests of Men and Women," *Journal of Social Psychology*, (1936), **7**, 49–67.

[9] *Thorndike Intelligence Examination for High School Graduates.*

TABLE 87

MEAN STANDARD IM, MF, AND OL SCORES OF OCCUPATIONS; ALSO CORRELATIONS BETWEEN OCCUPATIONS AND IM, MF, OL, AND INTELLIGENCE

Group	Occupation	Standard Scores			Correlations			
		IM	MF	OL	IM	MF	OL	Intelligence
		1	2	3	4	5	6	7
I	Artist	46.2	33.0	58.9	—.53	—.44	.18	.18
	Psychologist	51.6	47.9	60.9	—.14	—.14	—.14	.38
	Architect	50.7	43.8	61.0	—.46	—.11	—.03	.23
	Physician	49.7	46.4	61.3	—.51	—.06	.03	.24
	Dentist	51.8	53.2	57.7	—.39	.14	—.24	.07
II	Mathematician	49.4	47.8	61.5	—.47	.11	—.13	.35
	Physicist	47.8	55.7	61.0	—.51	.32	—.17	.34
	Engineer	51.6	61.9	61.4	—.44	.64	—.20	.28
	Chemist	50.6	57.1	60.0	—.38	.44	—.28	.35
III	Production manager	53.0	59.1	60.2	.01	.79	—.23	.04
IV	Aviator	50.7	58.2	54.3	—.26	.76	—.59	.22
	Farmer	50.2	51.2	55.7	—.29	.68	—.62	.06
	Carpenter	51.3	58.6	48.5	—.14	.63	—.72	—.02
	Printer	53.4	47.3	51.5	.03	.37	—.82	.12
	Mathematics-science teacher	55.1	50.3	55.0	.30	.49	—.72	.08
	Policeman	53.8	51.2	50.0	.27	.57	—.77	—.13
	Forest service	52.5	52.2	56.4	.08	.59	—.62	—.03
V	Y.M.C.A. physical director	56.2	47.1	55.8	.67	—.03	—.49	—.18
	Personnel manager	56.5	50.7	61.4	.75	—.06	—.10	—.02
	Y.M.C.A. secretary	58.7	40.0	59.4	.84	—.34	—.18	—.18
	Social science teacher	57.0	42.9	56.1	.75	—.40	—.21	—.21
	City school superintendent	56.5	44.6	63.4	.63	—.51	.10	—.06
	Minister	57.3	35.1	58.8	.54	—.56	—.14	.02
VI	Musician	52.8	40.6	53.8	.04	—.41	—.42	.02
VII	C.P.A.	53.9	46.4	63.4	.09	—.29	.43	.22
VIII	Accountant	55.4	50.1	59.5	.52	.32	—.26	—.10
	Office worker	54.6	52.0	57.0	.61	.16	—.33	—.25
	Purchasing agent	53.9	55.6	60.0	.03	.46	.01	—.21
	Banker	53.4	49.2	58.1	.17	—.01	.05	—.33
IX	Sales manager	54.3	51.8	63.3	.21	—.31	.42	—.23
	Real estate salesman	51.9	47.3	60.4	—.02	—.28	.41	—.22
	Life insurance salesman	53.8	42.4	62.3	.27	—.49	.47	—.26

TABLE 87 (*Concluded*)

Group	Occupation	Standard Scores			Correlations			
		IM	MF	OL	IM	MF	OL	Intelligence
		1	2	3	4	5	6	7
X	Advertising man	52.8	39.0	63.8	—.08	—.74	.52	.01
	Lawyer	52.4	47.0	64.4	—.15	—.62	.60	.13
	Author-journalist	47.5	31.8	63.0	—.45	—.66	.46	.18
XI	President	52.8	51.7	63.4	—.32	.03	.63	—.03
IM		....	....	....	...	—.14	—.20	.16
MF		....	....	....	—.14	...	—.41	.13
OL		....	....	....	—.20	—.41	...	.05

with each other. The data in Table 89 indicate, however, that this is not the case—that in fact the three scales correlate in the neighborhood of zero with each other except MF and OL, which correlate —.406. These coefficients result from correlating the scores obtained by 285 college seniors on the three scales. It is evident that the three special scales cannot be identified closely with any three of the factors obtained by factor analysis either before or after normal rotation. It is, however, possible that they may be identified with two of these factors and a new oblique factor.

TABLE 88

RANK-ORDER CORRELATIONS BETWEEN IM, MF, AND OL AND FIVE FACTOR LOADINGS BEFORE AND AFTER ROTATION*

Scale	Before Rotation					After Rotation				
	I	II	III	IV	V	I_4	II_4	III_2	IV_2	V_2
IM	—.14	.89	.39	.07	.00	—.81	.13	—.03	.47	.60
MF	.29	—.48	.82	.06	—.17	.09	.05	—.83	—.48	—.27
OL	—.62	.17	—.67	—.65	.06	—.10	.12	.91	—.23	.15

* Measures of IM, MF, and OL are those in columns 4 to 6 of Table 87. Factor loadings are given in Tables 30 and 33.

Intercorrelations between occupations and IM, MF, and OL used as co-ordinates.—If we assume that the three scales—IM, MF, and OL—are orthogonal, we may picture the relationships of the several occupations by plotting the coefficients of correla-

tions just as we would factor loadings. The error in making such an assumption is not great except possibly in the case of plotting MF and OL together. And even here there is some question about the correlation of —.406 between them, for the coefficient of —.17 is obtained by a second procedure (see Table 89). When the coefficients of correlation between occupations and the three scales are plotted, we have Figures 23 to 26. In the first of these

TABLE 89

INTERCORRELATIONS BETWEEN IM, MF, AND OL*

Scale	First Procedure		Second Procedure	
	MF	OL	MF	OL
IM	—.140	—.198	—.120	—.148
MF	....	—.406	....	—.174

* Based (1) on scores of 285 college seniors, and (2) on mean standard scores of 34 occupations as given in columns 1 to 4 of Table 87.

figures the occupations are plotted in terms of IM and MF. Occupations with plus co-ordinates in OL are connected with solid lines, occupations with minus co-ordinates in OL with dotted lines. Occupational groups in solid lines are to be thought of as located on the front surface of the sphere, while occupations in dotted lines are located on the back side of the sphere. There is accordingly no overlapping at all between groups depicted by solid and dotted lines.

Group III (production manager) has the most masculine interest, followed by Group IV (farmer, etc.) and, to a lesser degree, Groups II (engineer, etc.) and VIII (purchasing agent, etc.). Group X (advertising, etc.) has the most feminine interest, followed by Group IX (life insurance salesman, etc.) and by about half each of Groups V (minister, etc.) and I (artist). Also it appears from Figure 23 that Groups X (journalist), I (physician), II (physicist) and XI (president) have juvenile interests, whereas Group V (Y.M.C.A. secretary, etc.) and part of Group VIII (office man, etc.) have interests of older men.

Figure 24 pictures the relationships of occupations in terms

of IM and OL where occupations with plus co-ordinates in MF are connected with solid lines and occupations with minus co-ordinates in MF are connected with dotted lines. Groups XI (president), X (advertising, etc.), IX (sales), and VII (C.P.A.) have interests most characteristic of men earning $2,500 a year or better, whereas Group IV (carpenter, etc.) has these interests the least of all. The distribution as to interests characteristic of 15- and 25-year-old men is of course the same here as in Figure 23.

Figures 25 and 26 picture the relationships of occupations in terms of MF and OL: two figures are published in order to obviate the confusion resulting from overlapping lines inherent in one figure. Group X (advertising, etc.) has most distinctly both feminine and $2,500-a-year interests, whereas Group IV (carpenter, etc.) has just the reverse, i.e., both masculine and common labor interests. There are no groups of occupations that have the reverse type of interests, i.e., masculine and $2,500 a year or feminine and common labor. This situation is possibly a resultant of the negative correlation between MF and OL, namely, that feminine interests in men are much more likely to go with interests of men earning $2,500 a year, while masculine interests are associated much more with the interests of common labor.

The four figures picture the relationships among occupations expressed in terms of IM, MF, and OL. The relationships so expressed are far more useful than those expressed in tables where the occupations are listed in rank order according to their correlation with IM, MF, and OL, respectively. Each occupation has a certain amount of all three factors—it cannot be expressed in terms of any one alone. In addition each occupation has a certain amount of other unknown factors, for the total variance of the occupational scales which may be accounted for by IM, MF, and OL does not add up to the reliability of the scales.

Standard scores of IM, MF, and OL as co-ordinates.—It is possible to plot the standard mean scores of the occupations in a manner corresponding to Figures 23 to 26. When this is done, approximately the same relationships among occupations are disclosed by both systems of co-ordinates. This is not surprising, since the two sets of data, obtained in two entirely different ways, correlate between .864 and .987 with one another.

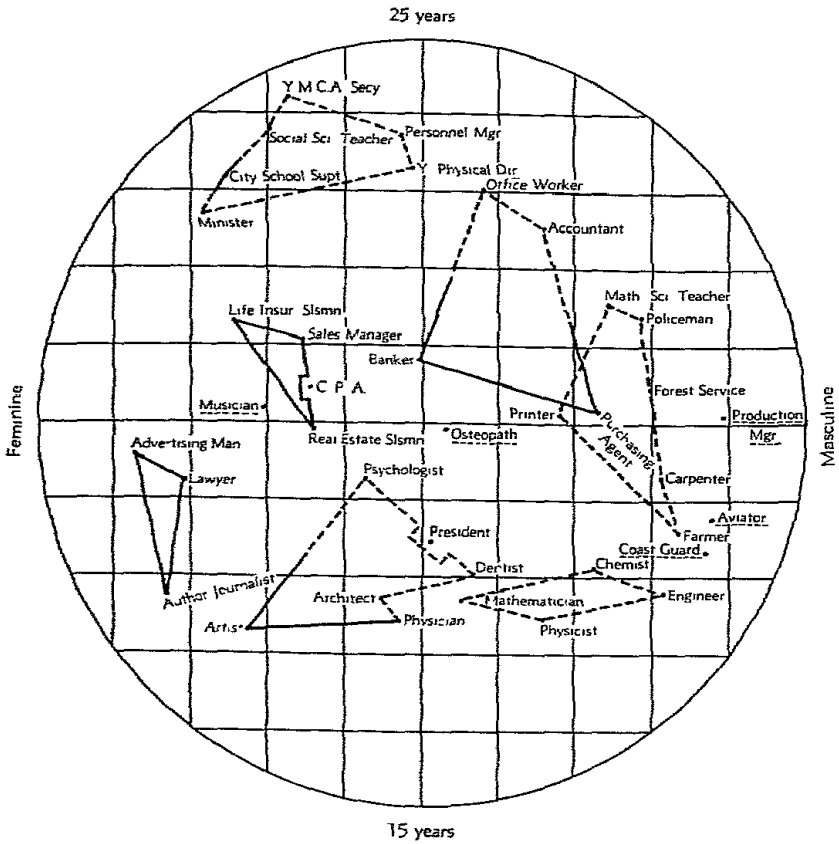


FIG. 23.—Distribution of occupations in terms of IM (vertical) and MF (horizontal) co-ordinates. Occupations with + OL co-ordinates connected with solid lines, those with — OL co-ordinates connected with dotted lines. Co-ordinates express correlations given in columns 4, 5, and 6 of Table 87.

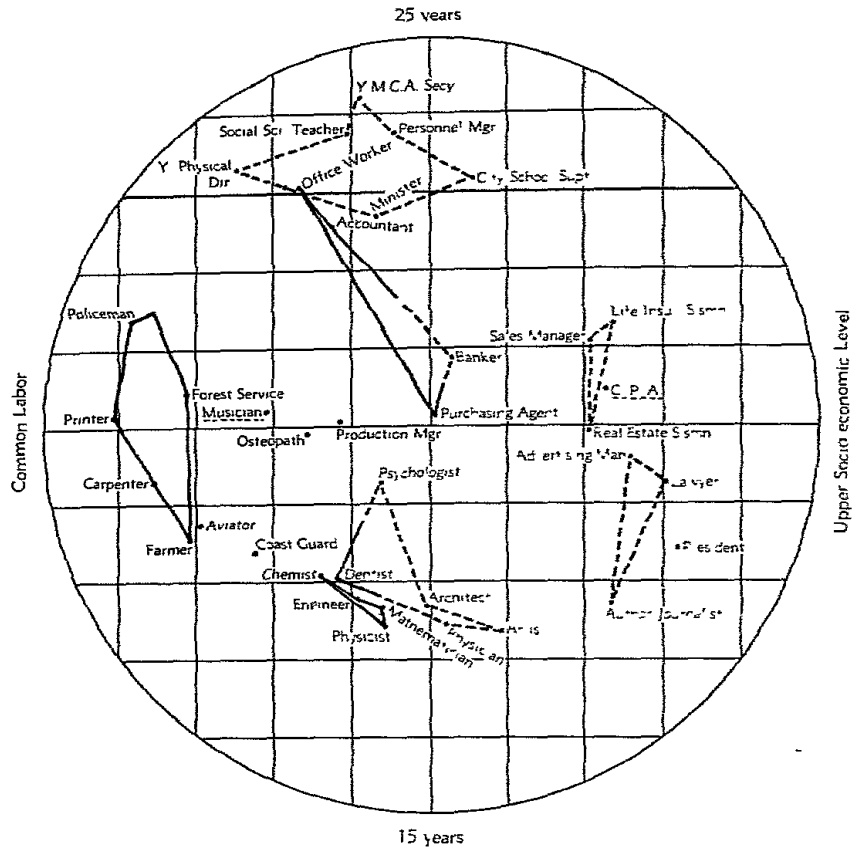
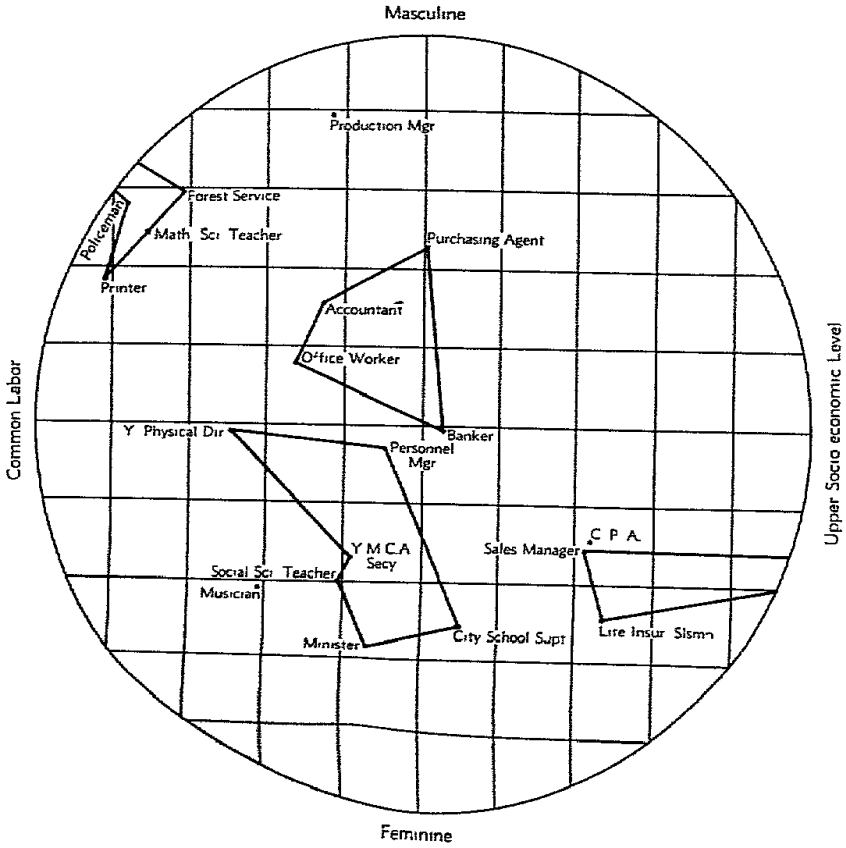
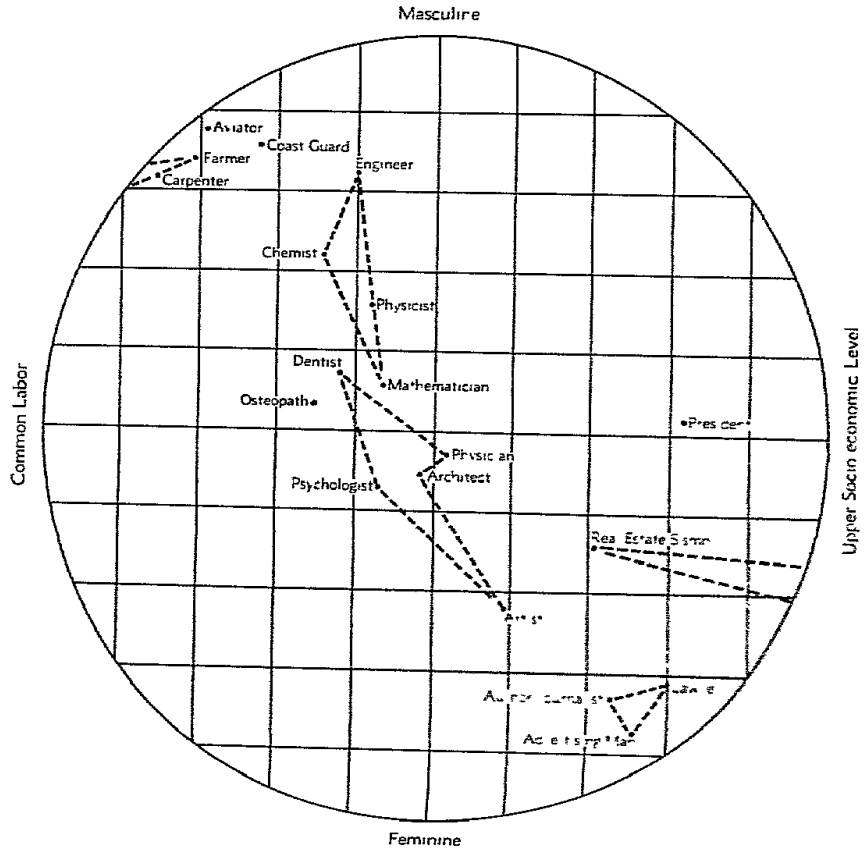


FIG. 24.—Distribution of occupations in terms of IM (vertical) and OL (horizontal) co-ordinates. Occupations with + MF co-ordinates connected with solid lines, those with — MF co-ordinates connected with dotted lines. Co-ordinates express correlations given in columns 4, 5, and 6 of Table 87.





FIGS. 25 and 26.—Distribution of occupations in terms of MF (vertical) and OL (horizontal) co-ordinates. Occupations with + IM co-ordinates shown in Figure 25, those with — IM co-ordinates shown in Figure 26. Co-ordinates express correlations given in columns 4, 5, and 6 in Table 87.

There is one difference, however, between the data based on correlations and those on mean scores: MF appears to influence the relationships based on mean scores much more than those based on correlations. The apparent explanation for this is that there is about twice the range of mean scores with MF as with IM and OL, i.e.:

Range of IM scores.....46.2 (artist) to 58.7 (Y. secretary), a difference of 12.5
Range of OL scores.....48.5 (carpenter) to 64.4 (lawyer), a difference of 15.9
Range of MF scores.....31.8 (journalist) to 61.9 (engineer), a difference of 30.1

Unfortunately for our purposes the standard scores of these three scales are not based on the same populations. It is entirely possible that two standard scores on the MF scale are equal to one standard score on the OL scale. If such is the case, the seemingly greater influence of MF scores than OL and IM scores when standard mean scores are plotted is explained.

COMPARISON OF THREE SETS OF CO-ORDINATES

Co-ordinates derived from factor analysis afford the most satisfactory basis for expressing the relationship between occupations; for the three factors after rotation of axes, I_4, III_2, and IV_2 have average variances, respectively, of .29, .26 and .16, amounting to .72, whereas the co-ordinates based on city school superintendent, journalist, and realtor have a combined variance of .65 and the co-ordinates based on IM, MF and OL have a combined variance of only .57.[10] Although all three sets of factors clearly differentiate the occupational groups, in no case can occupational scores be deduced from any one of these three sets of factors with a sufficiently high degree of accuracy because of the insufficient amount of the variance of each scale which is "explained" by the three factors. This is especially true of the last set of three factors (IM, MF, and OL), where in 40 cases taken at random the correlations between two occupations based on the three co-ordinates

[10] City school superintendent has an average variance of .17, journalist one of .22, and realtor one of .26; IM has a variance of .17, MF of .21, and OL of .19.

differ on the average by .289 from the correlations given in Table 193 (facing p. 716).

The interests represented in 34 occupations may be expressed in terms of IM, MF, and OL; but when this is done it must be remembered that the three special scales account for only 57 per cent of the total variance. If 10 per cent is relegated to unreliability of the scales, there remain 33 per cent not accounted for.

Assignment of a new occupation to its group.—It would be a laborious task to make a factor analysis each time a new occupational scale is prepared in order to determine to which occupational group the occupation is to be assigned. Even to calculate the correlations between the new scale and all other scales is a job. The best short cut is to calculate the correlation between the new scale and IM, MF, and OL and to plot the correlations as in Figures 23 to 26. By this procedure it is possible to assign aviator to Group IV. But in the cases of osteopath and public utility salesman this short cut is not sufficient; intercorrelations among all the scales are necessary to determine the classifications, because the two new occupations do not fit into any established group.

RELATIONSHIP OF INTERESTS TO MEASURES OF APTITUDES AND ATTITUDES

Another approach to the problem of what factors underlie interests is to note the relationships which exist between the various interest scales and other measures of personality. Accordingly a review is given below of certain studies in which interests have been compared with tests of aptitudes, attitudes, and personality characteristics.

INTELLIGENCE AND INTERESTS

Table 90 presents eight sets of correlations between intelligence- and interest-test scores. The first seven sets pertain to the original interest scales, the last set to the revised scales. Among the seven sets of data there are variations in the age, amount of education, and occupations of the individuals tested, and in the intelligence tests used. Several conclusions are supported by these data.

TABLE 90

CORRELATION BETWEEN INTELLIGENCE- AND INTEREST-TEST SCORES

Group	Occupation	Old Scales							Revised Scales
		274 College Seniors	137 Junior College Students	385 Junior College Freshmen	70 11th & 12th High School	100 Junior College	83 Employed Salesmen	150 Teacher's College Freshmen	274 College Seniors
		Thorndike Aptitude	Iowa H.S. Content[a]	Thurstone[a]	Terman Group[b]	American Council[c]	Pressey Classification[d]	Henman-Nelson[e]	Thorndike Aptitude
I	Artist	.16	...	.21	.04	...	.14	...	.18
	Psychologist	.37	.43	.41	.36	...	.15	...	.38
	Architect	.14	.21	.19	.07	...	.17	...	.23
	Physician	.16	.27	.19	.04	—.02	.10	—.03	.24
	Dentist	—.01	...	...	...	...	...	...	.07
II	Physicist	.32	.37	.27	.19	...	.13	...	.34
	Mathematician	.31	.36	.30	.18	...	.15	...	.35
	Engineer	.21	.20	.14	.17	.10	.08	.15	.28
	Chemist	.30	.34	.15	.31	...	.03	...	.35
III	Production manager	...	...	...	...	...	...	...	.04
IV	Farmer	.03	.03	.02	.02	...	—.05	...	.06
	Carpenter	—.11	...	...	...	...	...	...	—.02
	Printer	...	...	...	...	...	...	...	.12
	Mathematics-science teacher	...	...	...	...	...	...	...	.08
	Policeman	...	...	...	...	...	...	...	—.13
	Forest service	...	...	...	...	...	...	...	—.03
V	Y.M.C.A. physical director	—.26	...	—.21	...	...	—.19	...	—.18
	Personnel manager	—.16	—.10	—.13	.27	—.08	—.07	...	—.02
	Y.M.C.A. secretary	—.22	—.19	—.18	.14	...	—.15	...	—.18
	Social science teacher	...	...	...	...	...	...	...	—.21
	City school superintendent	—.12	.03	.01	.32	...	.06	...	—.06
	Minister	—.03	—.02	—.02	.23	...	—.12	...	.02
	School man	—.01	.07	.04	.35	...	—.15	.08	...
	Boy scout master	—.18	...	—.28	...	...	...	...	...
VI	Musician	—.02	...	—.02	...	...	...	...	.02
VII	C.P.A.	.10	.05	.02	.09	...	.13	.04	.22
VIII	Accountant	—.17	...	...	...	...	...	...	—.10
	Office worker	—.31	—.27	—.28	.09	...	—.38	...	—.25
	Purchasing agent	—.25	—.33	—.31	.00	—.32	—.07	...	—.21
	Banker	...	...	...	...	...	...	...	—.33

TABLE 90 (*Concluded*)

Group	Occupation	Old Scales							Revised Scales
		274 College Seniors	137 Junior College Students	385 Junior College Freshmen	70 11th & 12th High School	100 Junior College	83 Employed Salesmen	150 Teacher's College Freshmen	274 College Seniors
		Thorndike Aptitude	Iowa H.S. Content[a]	Thurstone[a]	Terman Group[b]	American Council[c]	Pressey Classification[d]	Henman-Nelson[e]	Thorndike Aptitude
IX	Sales manager	...	...	...	...	...	...	...	—.23
	Realtor	—.27	—.24	—.17	—.15	...	.20	...	—.22
	Life insurance salesman	—.35	—.34	—.31	—.19	—.12	.00	—.28	—.26
	Vacuum cleaner salesman	—.36	—.40	—.40	—.14	...	—.36	...	...
X	Advertising man	.02	.14	.12	—.11	...	.45	...	.01
	Lawyer	.07	.21	.20	.13	.00	.39	.01	.13
	Author-journalist	.07	.22	.11	—.09	...	.35	...	.18
XI	President	...	...	...	...	...	...	...	—.03
Interest maturity 15–55		—.06	...	.07	...	...	...	...	...
Interest maturity 15–25		...	...	...	...	...	...	...	—.16
Masculinity-Femininity		...	...	...	...	...	...	...	.13
Occupational level		...	...	...	...	...	...	...	.05

[a] K. W. Shlaudeman, unpublished study, 1934. Data from Long Beach, California.
[b] H. D. Carter, "Twin Similarities in Occupational Interests," *Journal of Educational Psychology* (1932), Vol. 23, p. 646.
[c] D. Segel, "Differential Prediction of Scholastic Success," *School and Society* (1934), Vol. 39, p. 2.
[d] I. R. Berman, J. G. Darley, and D. G. Paterson, "Vocational Interest Scales," *Employment Stabilization Research Institute* (University of Minnesota, 1934), Vol 3, No. 5, p. 19.
[e] L. E. Alteneder, "The Value of Intelligence, Personality, and Vocational Interest Tests in a Guidance Program," *Journal of Educational Psychology* (1940), Vol. 31, p. 457.

1. Occupational-interest scales measure traits which are not primarily associated with intelligence, for the correlations are small: 80 per cent range between .30 and —.30; 97 per cent between .40 and —.40; and the largest coefficient is only .45. It is accordingly impossible to appraise with any accuracy a person's intelligence from his interest scores or vice versa.

2. Revision of the interest scales has had no effect upon the relationship between intelligence and occupation interests, for the rank-order correlation between the coefficients in columns 1 and 8 is .99.

3. The relationship between intelligence and interests is apparently affected by sex, age, amount of education, occupation, and form of intelligence test. The coefficients in the first three columns correlate .95 to .98; hence data from junior college and university students based upon the *Thorndike Intelligence Examination for High School Graduates*, the *Iowa High School Content*, and the Thurstone tests are in close agreement. But these three sets of data correlate between .42 and .48 with those in the fourth column, composed of high-school boys tested on the *Terman Group Test of Mental Ability*. There is no way of telling whether the disagreement is caused by differences in age or in intelligence test. The data in column 6 composed of employed salesmen correlate between .58 and .70 with the data in columns 1 to 3 but —.19 with Carter's data from high-school boys. In both cases there are differences in age, presumed amount of education, occupation, and intelligence test which may be responsible.

4. On the whole, intelligence is positively correlated with occupational interests in Groups I, II, VII, and X; negatively correlated with Groups V, VIII, and IX; and unrelated to Groups III, IV, VI, and XI.[11] These differences are not great, but those between Groups I, II, VII, and X and Groups V, VIII, and IX are statistically significant. This means that men of high intelligence are more likely to have the interests of scientists, public accountants, lawyers, and writers and less likely to have the interests of men dealing with office procedures[12] and with people—selling and serving them. But, as previously pointed out, the differences are too slight to be usable in prediction of individual cases.

The only data in our possession regarding the relationship between intelligence and women's occupational interests are from Alteneder[13] and Laleger.[13a] The former concern 150 freshman women in a state teachers' college tested on the *Henman-Nelson*

[11] Intelligence is frequently associated with verbal ability, but Group X, representative of verbal ability, correlates lower with intelligence than do Groups I and II, representative of scientific ability.

[12] There is an interesting paradox to conjure with here. Success in office work is definitely correlated with intelligence, but intelligence and interests of office people are negatively correlated.

[13] L. E. Alteneder, "The Value of Intelligence, Personality, and Vocational Interest Tests in a Guidance Program," *Journal of Educational Psychology* (1940), **31**, 457.

[13a] G. E. Laleger, *The Vocational Interests of High-School Girls*, Teachers College, Columbia University, Contributions to Education, 1942, No. 857, p. 68.

Test of Mental Ability and the latter concern 703 third-year high-school girls tested on the *Pressey Senior Classification and Verifying Tests.* The two sets of correlations follow.

Occupational Scale	Laleger	Alteneder
Artist	.36	..
Author	.17	..
Dentist	−.10	..
Housewife	−.31	..
Lawyer	.10	.19
Librarian	.19	.28
Life insurance saleswoman	.00	.10
Nurse	−.16	−.11
Office worker	−.28	..
Physician	.29	..
Social worker	.33	.19
Stenographer-secretary	−.34	−.18
H.S. teacher (English)	.31	..
H.S. teacher (Math.-Science)	.13	..
H.S. teacher (Social science)	.12	..
H.S. teacher (General)	.27	.01
Y.W.C.A. secretary	—.06	..
M.F.	.17	..

These are all low correlations similar to those reported for men in Table 90.

Carter[14] published correlations between scores of 75 eleventh- to twelfth-grade girls on an intelligence test and on various men's scales. These correlations averaged slightly higher for the girls than for the boys[15] (mean of absolute values being .21 and .16, respectively). But the two sets of correlations correlated only .25. Whether this is caused by immaturity, differences in sex, or inadequate sampling remains to be determined.

High and low intelligence-test scores and interest scores.—The *American Council on Education Psychological Examination* was given to 9,990 junior college students, most of whom resided in California. The distribution of scores closely resembled a normal curve of distribution, the mean score being 137.5. A total of 195 men who had scores in the upper 5 per cent of the total distribution and 157 men having scores in the lower 15 per cent of the distribution filled out the *Vocational Interest Test.* Wrenn reports:

> Forty-five percent of them [the superior group] were found to have A or B ratings in the "science" group of vocations. This is exactly twice the

[14] H. D. Carter, "Twin Similarities in Occupational Interests," *Journal of Educational Psychology* (1932), **23**, 641–55.

[15] Data for the boys given in column 4 of Table 90.

percentage of similar ratings secured by the low intelligence group. When the vocational scales, which are commonly classified as professions, were considered, it was found that 61 per cent of the high-score students had A or B ratings in one or more of the following vocational scales and in the order listed: lawyer, physician, chemist, newspaper editor, high school teacher, engineer, mathematician, psychologist, physicist, architect, and minister.

These vocational-interest-test ratings were compared next with the vocational choices stated at the time the test was taken. It was found that forty-five per cent of the high score students had A ratings in the vocations which they had chosen as life work and that 97 per cent had A and B ratings in such vocations. This left only 3 per cent of the high-score group with C, or negative, ratings in the vocation chosen. . . . [But] only 22 per cent [of the low-score group] had A ratings in the vocations chosen while 20 per cent had negative or C ratings.[16]

Low correlations will theoretically predict extreme cases quite well. Here they foretell remarkably well the way in which men of high and low intelligence score on the occupational scales. This is shown by the data in this study, where the difference was found between the percentage of superior and inferior men who rated A and B in each occupation. When the occupations were ranked on the basis of these differences the rank order correlated .945 with the correlations between occupational interest and intelligence reported in the last column of Table 90. In general, the plus correlations in this table indicate the occupations upon which men of high intelligence are apt to be rated high and the negative correlations the reverse.

Number of likes and intelligence.—Information tests are used to measure intelligence on the assumption that the greater the intelligence the greater the breadth of knowledge of everyday affairs. Knowing this, one would naturally assume that intelligence would be associated with breadth of interest. Data in Table 91 show, however, no such relationship. Actually there is a slight negative correlation between number of items liked and intelligence.

Slightly more negative correlations occur between scholarship and L or L—D than with intelligence, but the differences are not significant.

It has often been urged that scholarship results from lack of interest in social affairs. The correlations in Table 91 suggest that

[16] C. G. Wrenn, "Aiding the Fit," *Journal of Higher Education* (1935), 6, 357–63.

this is true to only a very slight degree, if at all. Lack of liking amusements correlates .14 with scholarship; but this relationship loses the slight significance it has in the light of the correlation of —.05 between liking school subjects and scholarship.

TABLE 91

CORRELATION BETWEEN (1) INTELLIGENCE AND (2) SCHOLARSHIP AND NUMBER OF ITEMS LIKED, ALSO NUMBER OF LIKES MINUS NUMBER OF DISLIKES

(N = 285 College Seniors)

Group	Items Liked	Thorndike Intelligence Test		Grade Point Ratios	
		Versus Number of Likes	Versus Number of Likes minus Dislikes	Versus Number of Likes	Versus Number of Likes minus Dislikes
I	Occupations	—.03	—.01	—.14	—.10
II	School subjects	—.06	—.05	—.05	—.04
III	Amusements	—.12	—.11	—.14	—.12
IV	Activities	—.11	—.15	—.12	—.19
V	Kinds of people	.05	.03	—.03	.00
	Average	—.05	—.05	—.10	—.09

Table 92 shows the occupational scores that are obtained if a person marks (1) all the likes on the blank, (2) all the indifferences and (3) all the dislikes. In the first case he receives 10 A and B+ ratings; in the second case 7 high ratings; and in the third case 7 high ratings. He also receives 3 very low scores of 15 standard score or lower in the first case, 4 in the second case, and 14 in the third case. It is not easy to summarize these scores, but certain relationships are evident. If one likes all the items he secures a high rating (40 and above) in Group V, also in office worker and accountant of Group VIII, and policeman and mathematics-science teacher of Group IV; and if he dislikes all the items he secures a very low rating (15 or below) in these occupations. If one dislikes all the items he obtains a high score in Groups X and XI, also in realtor, artist, and physician. If one is indifferent to all the items he obtains high ratings in Group IV, also in musician, social science teacher, and Y.M.C.A. secretary.

The data in this table are far less in harmony with the hypothesis expressed above than the data in Table 91. It is the occupations that correlate negatively with intelligence (see last column of Table 90) that have high scores in the first column of Table 92,

TABLE 92

OCCUPATIONAL-INTEREST SCORES WHEN ALL THE ITEMS ARE MARKED (1) LIKE, (2) INDIFFERENT, AND (3) DISLIKE

Group	Occupation	LIKE Standard Score	INDIFFERENT Standard Score	DISLIKE Standard Score
I	Artist	11	21	50
	Psychologist	18	29	8
	Architect	6	22	36
	Physician	23	17	48
	Dentist	21	18	30
II	Mathematician	−1	30	32
	Engineer	22	18	28
	Chemist	27	26	19
III	Production manager	46	21	19
IV	Farmer	21	55	26
	Carpenter	28	39	9
	Printer	38	59	6
	Mathematics-science teacher	42	53	−9
	Policeman	46	42	4
	Forest service	19	38	−21
V	Y.M.C.A. physical director	51	36	−25
	Personnel manager	57	30	−13
	Y.M.C.A. secretary	46	41	−19
	Social science teacher	46	47	−8
	City school superintendent	27	27	−7
	Minister	42	27	−12
VI	Musician	25	52	15
VII	Certified public accountant	32	13	26
VIII	Accountant	49	32	2
	Office worker	56	38	7
	Purchasing agent	29	20	28
	Banker	27	36	35
IX	Sales manager	36	16	28
	Real estate salesman	38	25	53
	Life insurance salesman	46	13	37
X	Advertising man	31	23	49
	Lawyer	29	13	49
	Author-journalist	21	23	59
XI	President, manufacturing concern	34	4	51

TABLE 92 (*Concluded*)

Interest Scale	LIKE Standard Score	INDIFFERENT Standard Score	DISLIKE Standard Score
Occupational level	46	28	71
Masculinity-Femininity	37	57	32
Group I	29	32	48
Group II	30	25	30
Group V	58	45	6
Group VIII	45	24	24
Group IX	46	24	45
Group X	34	28	62

and vice versa. In other words, the more items one likes the less likely one is to score high in an occupation which correlates positively with intelligence. Disliking many items is more a sign of intelligence than liking items.

Jacobsen's interest scales were based on men and women students of superior intelligence (65th percentile or higher in College Ability Test) and contrasted the interests of students of high and low scholarship (Average Honor Point Ratios of 1.60 and above vs. .99 and below). Among the items with significant weights, the number liked by the high-scholarship group (A) far exceeds the number liked by the low-scholarship group (B). Jacobsen states:

> This difference is particularly apparent for the occupational items, Group A liking six times as many occupations as Group B. Group B dislikes many more items than Group A, particularly in the miscellaneous group (six times as many). The toal number reacted to indifferently by Group A is greater than for Group B, although there is a reversal of position for occupational and miscellaneous items. Group B is indifferent to more occupations. Group A is indifferent to more miscellaneous items. Group B is ignorant of more items than Group A, particularly occupations.[17]

The difference between the findings of Jacobsen and those of the writer may possibly be explained on the basis that her two groups both possessed high intelligence but differed in scholarship, whereas our groups in Table 91 differed in one case in intelligence and in the other case in scholarship but each differed more or less

[17] M. M. Jacobsen, "The Quantitative Determination of Scholastic Interests among College Students," unpublished Doctoral dissertation (University of Minnesota Library, 1928), p. 117.

in the other quality also, since intelligence and scholarship correlate positively. Then her number of likes is the number of liked items that had significant weights, whereas our number of likes refers to all the items irrespective of size of weights.

Thorndike[18] lists "average or total tendency to enjoy" as one of his classes of interests. It is "probably in part a genuine difference in vigor and breadth of interests, and partly a difference in optimism which may well be closely correlated with the former." "It seems opposed to the interest in sedentary games and one's regular job." This total tendency to enjoy is measured not by number of items liked but by the sum of how much each item is rated as liked. In the light of experimentation by the writer on number of items liked, he doubts the value of any such measure of interest when a long list of miscellaneous items is employed. It is quite possible, on the other hand, that such a measure of interests can be used successfully in a limited area by restricting the list of items so as to express interest in some one category. Jacobsen's items "with significant weights" comprise a test of items which superior students prefer more than inferior students. Our classification of interest items into twelve categories in the last half of chapter 13 is representative of such lists.

Aptitudes and interests.—It would seem that there must be some relationship between interests and aptitudes. But so far the relationship has not been established. Adkins and Kuder,[19] for example, contrasted scores on the *Preference Record* of Kuder with scores on *Tests for Primary Mental Abilities* of Thurstone. They report:

> on the whole, relatively slight overlapping between the measures of ability and the preference measures. The trends of the relations which do appear, with one or two exceptions, may definitely be said to be in line with our expectations. However, the interpretation of preference scores as indicative of the presence or absence of special abilities is unwarranted by the results of this investigation.

Negative results, such as these, are to be expected when interest scores are used which express amount of interest in any direction.

[18] E. L. Thorndike, "The Interests of Adults," *Journal of Educational Psychology* (1935), **26**, 503–4.

[19] D. C. Adkins and G. F. Kuder, "The Relation of Primary Mental Abilities to Activity Preferences," *Psychometrika* (1940), **5**, 251–62.

Most groups differ very little in this respect, as pointed out in chapter 6. To obtain interest scores which will be indicative of success it is necessary to use differential interest scores and preferably differential interests which are especially designed for that particular purpose (see chapters 19 and 20 for further consideration of this point).

PERSONALITY FACTORS AND INTERESTS

Interests as measured today are related somewhat to certain personality factors and attitudes. Segel has shown that differential interests correlate much higher with differential school grades than with grades as given by instructors (see p. 527). It is quite likely that the rather low correlations so far reported between differential interests and personality factors and attitudes could be raised appreciably if the latter were expressed by differential scores.

Bernreuter personality factors and interests. — Shlaudeman factor-analyzed the intercorrelations between 26 of the earlier occupational scales and scales 2, 3, and 4 of the *Bernreuter Personality Inventory* and came to the conclusion that there was little in common between the two sets of scales.[20] The study of Tussing, reported below, indicates that interest items may be used to measure self-confidence and sociability to some degree.

Further experimentation upon the high-score and low-score groups of Wrenn, referred to above, showed that the latter scored significantly higher than the former on Bernreuter's dominance scale. This fact was interpreted by Wrenn, Ferguson, and Kennedy[21] as a manifestation of "compensation" for their inferior scholastic attainment, a tendency to exaggerate statements of their own prowess or of their self-confidence. As proof they pointed to the fact that the low-intelligence group marked significantly more items with a "Yes" in Part VIII of the *Vocational Interest Blank* than did the high-intelligence group (critical ratio of 8.3). The reverse was true for "?" responses. "Inferior junior college male students, with a long record of low grades and mediocre achievement, apparently assumed an attitude of 'pseudo-superiority' when it came to a self-expression of their own abilities."

[20] K. W. Shlaudeman, unpublished study, 1934. Of 75 correlations, five were .30 or larger, the largest being .36.

[21] C. G. Wrenn, L. W. Ferguson, and J. L. Kennedy, "Intelligence Level and Personality," *Journal of Social Psychology* (1936), 7, 301–8.

"Bell Adjustment Inventory" and interests.—Alteneder[22] reports 24 correlations between the four scales of Bell's *Inventory* and six occupational scales for men and 28 correlations respecting seven occupational scales for women. The two highest correlations among the 24 for men are both .25; among the 28 correlations for women there are four of .25 and over: .39 between social adjustment and lawyer, .38 between social adjustment and social worker, .34 between emotional adjustment and teacher, and .26 between home adjustment and teacher. On this basis there is little relationship between occupational interests and Bell's four adjustment scales. This conclusion is supported by Darley, who did not find significant differences (see below).

Allport-Vernon "Study of Values" and interests.—Ferguson, Humphreys, and Strong[23] tested 93 male college students on both the *Vocational Interest Blank* and the Allport-Vernon *Study of Values*. The former blanks were scored upon only eight occupational scales, namely, teacher, office worker, life insurance salesman, certified public accountant, physician, lawyer, Y.M.C.A. secretary, and chemist. Using Thurstone's centroid method, five factors were found—"one determined entirely by Strong scales, two wholly by Allport-Vernon scales." Possibly if all the occupational scales had been used, more overlapping between the two tests would have been found; but "it can be asserted that the *Vocational Interest Test* measures at least one factor that the *Study of Values* does not." A general summary of the findings is:

Factors of Ferguson, Humphreys, Strong	Factors of Thurstone	Allport-Vernon Values
I	II, Language	+ Aesthetic, + Theoretical, −Economic
II	III, People	(None)
III	I, Science	+Theoretical, −Political
IV	(None)	+Religious, +Social, −Aesthetic
V	(None)	+Political, −Economic [24]

[22] L. E. Alteneder, *op. cit.*

[23] L. W. Ferguson, L. G. Humphreys, and F. W. Strong, "A Factorial Analysis of Interests and Values," *Journal of Educational Psychology* (1941), **32**, 197–204.

[24] The authors state, "Although . . . . the signs for the economic and political values are opposed, a profile analysis indicates that they should have the same sign. Because of the arbitrary nature of signs in a factor problem it seems legitimate to reverse whichever sign makes interpretation more convenient." (Original draft of article.)

Both the Vocational Interest Test and the Study of Values yield comparable results with respect to sex differences. Vernon and Allport[25] report that males secure higher scores on the theoretical, economic, and political scales, while women secure higher scores on the esthetic, social and religious scales. Carter and Strong[26] have found (using the Vocational Interest Test) that men prefer scientific, athletic, legal, political and selling activities; while women prefer musical, artistic, literary, social and religious activities.

Sarbin and Berdie[27] tested 52 college students on the *Vocational Interest Blank* and the Allport-Vernon *Study of Values* test. Students who obtained a B— or higher in one-half or more of the occupational keys in any one occupational group were classified as having interest in that occupational group. Students who score C+ or C in more than one-half of the keys in a group were classified as having no interest in the group. Differences in the mean scores for those who have and do not have the interests of each occupational group upon each of the values were determined. Of 48 such differences six were statistically significant and two others were nearly so. The eight differences are:

Group I.	+ theoretical, — economic, + aesthetic, — political
Group II.	+ theoretical, — political
Group V.[28]	+ religious
Group IX.[28]	— theoretical

Although these differences are statistically significant, they are based on only a few cases. The overlapping is considerable, and application to individual cases is hazardous.

Van Dusen, Wimberly, and Mosier,[29] using the *Standards Inventory*, a modification of the *Study of Values*, have also reported definite relationships between these values and interest scores for certain occupational scales based upon data of 81 college men. Wickert's study indicates that occupational choices are related to

[25] G. W. Allport and P. E. Vernon, "A Test of Personal Values," *Journal of Abnormal and Social Psychology* (1931), **26**, 231–48.

[26] H. D. Carter and E. K. Strong, Jr., "Sex Differences in Occupational Interests of High School Students," *Personnel Journal* (1933), **12**, 166–75.

[27] T. R. Sarbin and R. F. Berdie, "Relation of Measured Interests to the Allport-Vernon Study of Values," *Journal of Applied Psychology* (1940), **24**, 287–96.

[28] Renumbered to agree with our occupational-group classification.

[29] A. C. Van Dusen, S. Wimberly, and C. I. Mosier, "Standardization of a Values Inventory," *Journal of Educational Psychology* (1939), **30**, 53–62.

scores both on the *Study of Values* and on a new test of goal-values.[30] *The Socialization–Self-seeking Test* of Thomson correlates positively with aesthetic, social, and religious values (r about .32) and negatively with economic ($r = -.55$) and political ($r = -.40$) values. It also correlates .51 with Occupational Group V and —.33 with Group VIII.[31]

Duffy and Crissy[32] have correlated the scores of 108 freshmen women on the Allport-Vernon *Study of Values* with scores on the occupational scales for women. The following are the statistically significant correlations:

	Values					
Occupation	Economic	Political	Aesthetic	Religious	Theoretical	Social
Lawyer[a]	.25	.24	—.36	—.25	..	..
Physician	..	..	..	..	.44	..
Artist	—.31	..	.45	..	..	—.35
Author	—.26	..	.37	..	..	—.25
Nurse	..	..	—.24	..	..	.28
Librarian	..	..	.36	..	..	—.32
Housewife	..	..	..	..	—.32	.34
Office worker	.37	.34	—.32	..	—.26	..
Secretary-stenographer	..	.32	..	..	—.32	..

[a] Ferguson *et al.* find just the reverse with regard to lawyer—correlations with economic and political are negative and those with aesthetic and religious are positive. The differences may be due to the fact that data of Ferguson are from male students using men's occupational scales, whereas the data of Duffy and Crissy are from women students using women's scales (see below, p. 166)

They point out that "although none of these correlations is very high, most if not all of them are in the expected direction."

Another study of this subject with women is that reported by Burgemeister.[33] She tested 164 Barnard College freshmen and retested them a year later on the *Lecky Individuality Record*, the Allport-Vernon *Study of Values*, and our interest blank for women. In the results which follow, those who scored high and those who

[30] F. Wickert, "The Interrelationships of Some General and Specific Preferences," *The Journal of Social Psychology* (1940), **11**, 275-302.

[31] W. A. Thomson, "An Inventory for Measuring Socialization-Self-seeking and Its Relationship to the Study of Values Test, the A C E Psychological Examination, and the *Strong Vocational Interest Blank*," *Journal of Applied Psychology* (1941), **25**, 202-12.

[32] E. Duffy and W. J. E. Crissy, "Evaluative Attitudes as Related to Vocation Interests and Academic Achievement," *Journal of Abnormal and Social Psychology* (1940), **35**, 226-45.

[33] B. B. Burgemeister, "The Permanence of Interests of Women College Students," *Archives of Psychology* (1940), No. 255.

scored low on each occupational scale were contrasted as to their mean scores on the other two tests. These high and low groups differed in size from scale to scale but in no case were less than thirty in number. They differed also in amount of difference in score on the occupational scales, sometimes representing A and C ratings, sometimes B+ and C+. The data appear in Table 93.

TABLE 93

RELATIONSHIP OF OCCUPATIONAL INTERESTS OF 150 COLLEGE FRESHMEN WOMEN TO WITHDRAWAL AND ALLPORT-VERNON VALUES*

Occupation	Values						Withdrawal: High Occupation —Low Occupation	(Lecky) High Withdrawal —Low Withdrawal[a]
	Theoretical	Economic	Aesthetic	Social	Political	Religious		
Author	...	—2.5	6.1	—3.8	—2.2	..	4.8	4.4
Librarian	2.8	—2.4	7.4	—4.3	—2.6	..	4.9	4.3
Artist	2.7	—3.1	6.9	—4.6	—2.3	..	4.4	4.5
Physician	7.3	—3.7	...	...	...	..	.6	1.9
Dentist	4.6	—2.0	...	...	—2.2	..	—1.0	—.5
Life insurance salesman	...	3.8	...	...	4.0	..	—3.9	—3.0
Social worker	...	—2.1	...	2.8	—2.0	..	.3	—.2
English teacher	—2.4	...	5.0	...	—3.1	..	2.0	.9
Social science teacher	...	...	...	2.6	...	..	—3.4	—1.6
Lawyer	...	...	—3.1	...	...	..	—.7	—.2
Y.W.C.A. secretary	...	...	...	3.7	—3.1	..	—2.8	—3.4
Mathematics-science teacher	4.9	...	—3.3	...	—2.4	..	—1.4	—2.9
Nurse	...	...	—3.4	3.3	...	..	—2.7	—2.0
Stenographer-secretary	—7.1	5.0	—3.2	...	4.8	..	—2.1	—1.4
Office worker	—3.3	3.3	—5.7	2.2	4.2	..	—2.8	—2.0
Housewife	—5.4	...	—4.1	3.4	2.4	..	—3.4	—2.0
MF (masculinity)	4.7	...	—2.0	—2.0	...	..	—.7	1.5

* Data are critical ratios; see text for explanation. After Burgemeister.

[a] These critical ratios are averages of two critical ratios based on test and retest scores, respectively.

On this basis those scoring high on the author scale, for example, scored higher on the aesthetic and withdrawal (Lecky) scales than did those scoring low on the author scale, and the former also scored lower than the latter on the economic, social, and political scales. The figures in the table are critical ratios, but only those of 2 or above are reported except in the last two columns regarding withdrawal. The data regarding withdrawal are presented in

two different ways: in the next to last column of the table the data have been calculated as described above; in the last column the high- and low-scoring students on the withdrawal scale are compared regarding their scores on the occupational scales—the reverse of the procedure above. There is very good agreement between the two sets of critical ratios in these last two columns.

There is remarkable agreement between the data furnished by Duffy and Crissy and those by Burgemeister. Authors, librarians, and artists have high aesthetic and withdrawal scores and low economic, social, and political scores. Other relationships can be read directly from Table 93.

These relationships between the Allport-Vernon values and occupational interests indicate general trends and aid in interpreting both sets of data. Unfortunately they are not high enough to warrant using either test for the other, since scores in one test cannot be transmuted into the other with sufficient reliability for use in individual diagnoses.

Tussing[84] demonstrates in his recent article that interest items can be scored in such a way as to measure somewhat several of the personality traits considered above. His procedure was as follows: Three hundred men were scored on the *Vocational Interest Test*, the Allport-Vernon *Study of Values*, the Bernreuter *Personality Inventory*, the Bell *Adjustment Inventory*, and the Otis *S-A Test of Mental Ability*. The percentage of likes, indifferences, and dislikes to each of the 400 items on the *Vocational Interest Blank* were determined for the 25 per cent of men who scored highest on the Allport-Vernon "theoretical" value; also for the 25 per cent of men who scored lowest on this value. Weights were determined for the 400 interest items on the basis of these two sets of percentages, using the same procedure as that of the writer. In similar fashion weights were determined for all of the personality traits measured by these tests. A new sample of 103 male college freshmen and sophomores was used as a validating group. Reliability (odd *vs.* even items) was determined for each of the new scales on the basis of the scores of the 103 men. Validity coefficients

[84] L. Tussing, "An Investigation of the Possibilities of Measuring Personality Traits with the *Strong Vocational Interest Blank*," *Educational and Psychological Measurement* (1942), **2**, 59–74.

were also determined by correlating the scores on the new "theoretical" scale and those on the Allport-Vernon scale and in similar fashion for the other personality scales. The coefficients are shown in Table 94.

TABLE 94

RELIABILITY AND VALIDITY OF INTEREST SCALES MEASURING PERSONALITY TRAITS (AFTER TUSSING)

Test	Reliability	Validity
Bernreuter F1-C	.86	.48
Bernreuter F2-S	.77	.52
Allport-Vernon Theoretical	.82	.48
Allport-Vernon Economic	.80	.56
Bell Home Adjustment	.83	.21
Bell Health Adjustment	.70	.34
Bell Social Adjustment	.87	.50
Bell Emotional Adjustment	.77	.07
Otis Intelligence	.80	.45

The results indicate that interest items can contribute to the measurement of two of Bernreuter's scales, two of Allport-Vernon's scales, the Social Adjustment scale of Bell, and the intelligence test of Otis, but not appreciably to Bell's Home, Health, and Emotional scales.

Attitudes and interests.—Students in the General College of the University of Minnesota were given four to five hours of testing including the *Strong Vocational Interest Blank* (scored on 27 occupational scales), the *Minnesota Scale for the Survey of Opinions* (scored for morale, feelings of inferiority, family adjustments, attitudes toward law, economic conservatism, and education), the *Bell Adjustment Inventory* (scored for home, health, social, and emotional adjustments), and the *Minnesota Inventories of Social Attitudes* (scored for social preferences and social behavior).[85] Students were classified as to their primary occupational interest pattern on the basis of their A and B+ ratings on the *Strong Vocational Interest Blank* and assigned to one of the six occupational groups. Critical ratios were calculated between each of the six groups of students as to the differences in scores on the twelve parts of the other three tests. On the basis of these data the writer has

[85] J. G. Darley, "A Preliminary Study of Relations between Attitude, Adjustment and Vocational Interest Tests," *Journal of Educational Psychology* (1938), **29**, 467–73.

ranked the six groups as to their relative standing on the twelve attitude tests, where 1 is best and 6 is poorest. Since Darley has subdivided our Occupational-Group V into Social Service A and B, we will refer to the two subdivisions as V_a and V_b. With respect to morale, students scoring highest in Group V_b (personnel manager, for example) rank highest, students scoring highest in Group IX (life insurance) rank second, students in Group VIII (accountant) third, students in V_a (teacher) fourth, in Group X (lawyer) fifth, and in Group I (engineer) sixth. As these groups contain from 18 to 35 cases, except VIII, which has 103 cases, the results must be viewed as tentative. Nevertheless they suggest that there are relationships between occupational interests, attitudes, and adjustments to everyday life which are significant. Moreover, they emphasize the importance of determining the general profile of an individual upon a number of tests as a basis for guidance.[36] A portion of Darley's discussion follows.

Men with primary interest patterns in technical occupations achieve poorer morale scores than men in all other groups but verbal occupations. These men are characterized also by somewhat greater feelings of inferiority than men with primary interests in business contact or social contact jobs (Social Service B). They also seem to have markedly poorer social adjustments, fewer social preferences, and more limited social skills than men in nearly all other primary interest groupings. On the favorable side, they show a tendency for consistently better home, health and emotional adjustment. . . . . They show a similar tendency for less conservatism in regard to legal, economic, and educational questions than is found in men in the other primary interest groupings.

Some aspects of the foregoing sketch correspond to existing stereotypes of technical students on the campuses of the country—disinterested if not intolerant in regard to the more refined social amenities, and somewhat inept in social activities. In so far as the occupations within this pattern also include some academic workers, the tendency to limited socialisation, greater liberalism, and less dominance or self-assuredness is again typical. Finally, the evidence on the earlier maturation of this interest pattern may be related in some way to the attitude and adjustment characteristics of these men with primary interests in technical activities.

Men with primary interest patterns in occupations of the verbal or Social Service A groupings do not show characteristic attitudes or adjustments that set them significantly apart from men with other primary patterns. However, they *tend* to have poorer morale, greater feelings of in-

[36] Discussed further on p. 417, below.

feriority, poorer home or family, social, and emotional adjustments, more limited social preferences and less sure-footedness in social situations than men with primary patterns in the business contact and social service B occupations. It is also to be remarked that the occupations grouped as verbal and social service A tend to fall at the less masculine end of Strong's scale designed to measure masculinity of interests. The relation between this latter finding and the sketch of the attitude and adjustment attributes of these men is as yet obscure.

Men with primary interest patterns in business contact jobs, or sales jobs, are clearly better in social adjustments, have greater social preferences, and are more socially adept than men in all other groups except social service B, social contact jobs. These men with sales interests are, however, equally clearly differentiated from men in the social service B group by their greater economic conservatism. Note also the marked difference in social adjustments, preferences and skills between the business contact and the business detail workers; these differences lend considerable support to stereotypes of the aggressive salesman and the meek bookkeeper. Salesman and bookkeeper alike, however, are closely similar in regard to legal, economic, and educational conservatism.

Classification of interests.—Another approach to the determination of the basic interests is indicated in chapter 13. Here the items are classified by the writer and certain conclusions were drawn from the data based on all the items in each group. The material suggests interesting possibilities and should be examined on a more thoroughgoing basis. The writer suspects that some real relationships between interests and attitudes will be established, and that it is likely they will be formulated in terms of concepts such as are used in this section.

Many other classifications of interests have been given, some of which include wants, desires, or "instincts."[87] Whether or not there are both specific and general interests remains to be seen. If there are no general interests, any classification will be a grouping for convenience and not in terms of intrinsic traits.

[87] See, for example, two different classifications by E. L. Thorndike in: "The Interests of Adults," *Journal of Educational Psychology* (1935), **26**, 504, and *Adult Interests* (The Macmillan Company, 1935), p. 106. See also R. H. Gundlach and E. Gerum, "Vocational Interests and Types of Ability," *Journal of Educational Psychology* (1931), **22**, 505–11.

Part Four

GUIDANCE BASED ON INTERESTS

Occupational-interest scales were devised to differentiate members of occupations. Chapters 7 and 8 have shown that such differentiation is accomplished with interest scales.

Use of these scales for the guidance of young people involves at least three assumptions which must be established if guidance is to be warranted: first, that interests are quite permanent; second, that interests are little influenced by vocational training and experience; and, third, that young people who have responded to the interest items in a way similar to that of men in a given occupation will later on in life enjoy that career.

Chapter 15 shows that the first two of these assumptions are sufficiently valid for our purposes, and chapter 16 records two follow-ups of college students to show that there is a reasonable relationship between interest scores while in college and subsequent occupational career.

Chapter 17 considers in considerable detail how interest-test scores should be interpreted, and chapter 18 outlines how interest-test scores should be used in conjunction with scholastic records and scores on intelligence, aptitude, and personality tests.

Those not too familiar with the *Vocational Interest Blank* may find it advisable to read chapters 17 and 18 before chapters 15 and 16.

Chapter 15. Permanence of Interests

Interests are not static. They change somewhat from time to time. The nature of these changes and their amount must be understood if reliance is to be placed upon interests for guidance purposes.

STABILITY, RELIABILITY, PERMANENCE

How stable is each item? How reliable is each scale? And how permanent is any summary of a man's interests?

The term *stability* has reference to the shifts from liking to indifference or disliking, and the reverse, that are found in individual interest items. Practically all men like children, and they consistently say they do each time they are tested. This is then a very stable interest. Ordinarily stability has reference to lack of change over a relatively short period of time. This topic is considered in chapter 25.

Reliability has reference to the self-consistency of an entire interest test or of any of its parts; that is, it is a measure of the degree to which individuals will respond in the same manner to a test on two separate occasions. The interval of time between the two occasions should be long enough to eliminate immediate memory of the first responses but not so long that the individuals themselves will change in any important respect. This topic has already been considered in chapter 5.

Permanence means persistence in time without change. It is used by some writers with reference to a single item, e.g., a person's first choice of an occupation. But in this book it is employed with reference to a larger sampling of interests over a considerable period of time.

Changes in interests over many years have already been considered in chapters 12 and 13, where data from different age

groups have been pieced together to give as good an idea as po sible of how changes occur over the period from 15 to 55 yea of age. The discussion in this section is limited to changes ov periods not exceeding ten years and is based upon data from th same individuals who have been tested twice.

PERMANENCE OF FIRST CHOICE

Attempts to measure the permanency of vocational interes have been very largely confined to some such procedure as thi Subjects are requested to report their occupational choice on tw separate occasions, the percentage of equivalent choices bein considered a measure of permanency. In some studies, equiv lence has been limited to specific occupations; in others, occup tions have been classified into fifteen to thirty groups and onl changes from one group to another have been deemed not equiv lent.

Columba found long ago that over a year period more tha 50 per cent of elementary school children in the sixth, seventl and eighth grades change their preference of studies.[1] Fryer sun marizes the literature as follows:

> There is, in general, it would seem, about a fifty to fifty chance predicting the development of an interest trend (second choice within th same occupational groups as the first choice) over a considerable perio of time—fifty for and fifty against. This prediction is, of course, far abo a guessing basis when it is recalled that there are as many as thirty-thr possible trends which were used in some of the studies. The presence interest trends is an important factor to consider in mental developmen but it is not a factor that can be predicted with any high degree of a curacy.[2]
>
> . . . . There is a genetic development of interests. But this developme is not of a kind that will allow for the prediction of future interests for th practical purposes of vocational guidance. Interest development appea almost kaleidoscopic in form, it is ever changing its focus. Specific voc tional interests are likely to change in a year's time. Vocational intere trends go through a gradual process of change and are likely to be quit

[1] M. Columba, "A Study of Interests and Their Relations to Other Factors Achievement in the Elementary School Subjects," *Catholic University of America Ed cational Research Bulletin* (1926), 1 (No. 7), 29–33.

[2] Douglas Fryer, *The Measurement of Interests* (Henry Holt & Co., 1931), p 150–51.

different in later adolescence to what they were in early childhood. When all this has been said, however, there is permanence or stability of interests, as indicated in every study, to a surprising degree. It is made clear that what have been one's vocational interests in the past are the foundation of one's present interests.[3]

As far as the writer knows, the validity of occupational preference is unknown. It should be highest among male college seniors and should decrease with younger and less educated students. It should be less among females than males of equal age and education, for most of the former freely confess marriage is their goal and that they are interested in occupations as a means of earning their living only for a short time. Anyone who has examined the qualification cards of soldiers knows that a vast number have drifted from one job to another.

A few recent studies may be mentioned. Wilson[4] reports 59 per cent of college seniors entered the occupations which they had chosen while seniors. Strong[5] and Sisson[6] found about half of seniors in the occupations five years later that they had selected when seniors. The latter percentage drops to 33 when occupations engaged in five years after graduation are compared with occupational preferences when freshmen. Sisson comments:

Evidently, then, for our group, ultimate employment cannot be predicted with any accuracy on the basis of vocational choices made at the time of admission. Such a prediction would be correct in only 38 cases out of a hundred. And nearly all these correct predictions (32 of 38) would be lawyers, physicians, teachers or clergymen.

One study of this sort for high-school boys is that of Proctor, who reports greater permanence of vocational choice than has generally been accepted. In a 13-year follow-up of 945 high-school boys from the original group of 1,514 cases, he finds that 24.3 per cent "had arrived and were engaged in the occupation they had designated as their ambition thirteen years before. . . . . When rank of occupation was used as the basis of comparison

[3] *Ibid.*, p. 184.

[4] J. L. Wilson, *Kentucky Personnel Bulletin* (1933).

[5] E. K. Strong, Jr., "Predictive Value of the Vocational Interest Test," *Journal of Educational Psychology* (1935), **26**, 332.

[6] E. D. Sisson, "The Predictive Value of Vocational Choices of College Students," *School and Society* (1938), **47**, 646–48.

it was found that 60 per cent were in occupations of the same or equal rank with that given as their ambition in 1917–18."[7]

A rough measure of validity of vocational preferences might be obtained by correlating "immediate choice of occupation" with "occupation to be engaged in ten years hence." Unless the second represents an appropriate promotion from the first, the two are different choices as far as guidance is concerned. Laleger[8] gives the immediate choices of 703 third-year high-school girls and also their preferences ten years hence. At least 598 girls (85 per cent) shift their preferences. Undoubtedly there are others who have shifted who are not indicated by the table, e.g., a girl shifting from nurse to teacher and a second shifting in reverse manner.

Another approach to this topic is to correlate expressed occupational preferences with scores on an interest test. Crosby and Winsor[9] report an average correlation of .54 between estimated and tested interests of college students on the *Kuder Preference Test.* This fair agreement is between expressed interests and classification into seven classes of interests, which is quite another matter than correlation between expressed interests and specific occupational choices. On the other hand, Laleger finds that "neither the Strong nor the Manson Keys select to a significant extent [third-year high-school] girls who state their intention of entering occupations for which the keys are labeled (except the Strong lawyer Key)."[10] And Moffie[11] reports correlations ranging between —.07 and .54 (average of .22) between expressed choice of 80 N.Y.A. boys (average age of 18.7 years) and interest scores on the *Vocational Interest Blank.* Laleger concludes:

Insofar as stated choice of occupation by groups of individuals may be considered a true criterion of interest, the lack of relationship between

[7] W. M. Proctor, "A 13-Year Follow-Up of High-School Pupils," *Occupation* (1937), **15**, 308.

[8] G. E. Laleger, *The Vocational Interests of High-School Girls* (Teachers College, Columbia University, Contributions to Education, 1942, No. 857), p. 40.

[9] R. C. Crosby and A. L. Winsor, "The Validity of Students' Estimates of Their Interests," *Journal of Applied Psychology* (1941), **25**, 408–15.

[10] G. E. Laleger, *op. cit.*, p. 89. This conclusion is interesting in the light of her own table showing that at least 85 per cent of the girls are planning upon some other occupation ten years hence.

[11] D. J. Moffie, "The Validity of Self-Estimated Interests," *Journal of Applied Psychology* (1942), **26**, 606–13.

statement of occupational choice and interest scores or letter ratings may be considered evidence of the lack of validity of the interest inventories.

Laleger evidently assumes that the lack of agreement between expressed preferences and measured interests is a reflection of nonvalidity in the tests. Moffie apparently assumes the reverse when he concludes:

The lack of consistency between estimated and measured interests is most likely due to a lack of maturity and experience on the part of the student. . . . . It seems reasonable to believe that lack of maturity would invalidate such an instrument as the Strong much less than a self-estimate because of the very nature of the test itself. A trend or constellation of interests may be picked up by a test, whereas it may go unnoticed in a self-analysis.

Every student of the subject has reported some degree of permanence of first choices but not sufficient to rely very much upon such preferences as indicators of future behavior. To the writer it seems as appropriate to validate a new intelligence test against the responses to *one item* on the Army Alpha test as to attempt to validate an interest test against the first choices of students.

We are consequently little concerned with such measures of interest. Interest, we believe, should be measured by sampling many related activities and items, not merely one. And when measures are based upon many items, very surprising permanence is found. The evidence is clear from chapters 12 and 13 that interests are very stable from 25 to 55 years of age. The evidence is also clear that there are real changes in the period from 15 to 25 years of age. Although there are these changes, nevertheless interest patterns are really surprisingly stable from fifteen years of age on.

FIVE METHODS OF MEASURING PERMANENCE OF INTEREST-TEST SCORES

First, correlation between test and retest scores indicates how consistently the individuals have maintained their relative position in a group. Second, comparison of mean scores furnishes evidence as to whether there has been an increase or a decrease in interest in a given direction. Third, changes in interest ratings indicate how far reliance can be placed upon different ratings as a guide to future behavior. And, fourth, changes in the total profile of occupational scores similarly indicate how likely it is that the same general deduction from all scores will be valid in the future.

A fifth method is added here, by which interest scores before and after training and experience in an occupation are contrasted in order to show that these factors do not affect interests appreciably.

PERMANENCE MEASURED BY CORRELATION

Table 95 reports the correlations between two sets of scores from high-school and college students, the retests occurring at varying intervals from one week to ten years. The data show two things: first, permanence decreases with interval of time between tests. With college freshmen the coefficient decreases from .90 with an interval of a week to .80 with an interval of one year, to .68 with an interval of three years, and to .56 with an interval of nine years. Second, the younger the men tested, the lower the permanence. Both these relationships are shown in the following tabulation of the averages from Table 95 and the data of Carter concerning 11-year-old boys referred to below:

Interval	Coefficients			
	11-Year-Old Boys	High School	College Freshmen	College Seniors
1 week	...	...	.90	...
1 year	.62	.69[a]	.80	..
2 years	.51	.57[b]	...	...
3 years	.31	...	.68	...
4 years	.31	...	...	...
5 years	...	...	...	.75
6 years	...	.52	...	...
9 years	...	...	.56	...
10 years	...	...	...	.71

[a] The average of twelve correlations is .67 for 64 boys aged 16 and 17 years and .71 for the same boys aged 17 and 18 years. See K. von F. Taylor, "The Reliability and Permanence of Vocational Interests of Adolescents," *Journal of Experimental Education*, Vol. 11 (1942), p. 83.

[b] The average of twelve correlations is .60 for 64 boys aged 16 and 18 years and .73 for the same boys aged 18 and 20 years (*ibid.*).

These correlations mean that approximately the same rank order is maintained for occupational-interest scores for intervals ranging between one and ten years. In other words, those who had interests most similar to engineers, lawyers, or ministers on the first occasion were the ones who had scores most similar to those criterion groups on the second occasion, and vice versa. The data establish the fact that there is greater permanence of interests among students than has generally been believed.

The data of Carter for 11-year-old boys and girls retested four times at one-year intervals indicate much lower permanence of interests than that reported for older persons. The correlations for girls indicate slight increase in permanence from year to year as they grow older, but the reverse is the case for boys.[12]

Permanence of intelligence and interest-test scores.—"The adequacy of prediction of future mental development is a combined function of the age at which the test is given and of the length of time over which we try to predict."[13] This conclusion of R. L. Thorndike with respect to intelligence-test scores applies equally well to interest-test scores, as the summary given above makes clear.

Permanence of intelligence-test scores is somewhat greater than for interest-test scores. The average of several investigations using different intelligence tests upon college students give coefficients of .78 to .89 for varying intervals up to five years. For high-school students average permanence coefficients are .77 for one year, .70 for two years, .68 for three years, and .60 for ten years. R. L. Thorndike[14] computed the different values of r between test and retest of the Binet test upon "mostly children" for different intervals of time and found a correlation "close to .90" for 1 year, .79 for 3 years, and .70 for 5 years. Traxler[15] reports correlations ranging from .58 to .92 for a year interval on 104 high-school pupils on parts of the *Primary Mental Abilities Test.* The highest agreement was found in the number, verbal, and spatial factors where the correlations were over .80. These examples give, as we stated above, somewhat higher correlations between test and retest for intelligence than for interest scores.

Burnham reports a correlation of .58 between scholastic grades of his three-year group in Table 95 tested when freshmen and retested when seniors. "Numerical scores on the *Vocational Interest Blank* are more stable over the college period than college grades."

[12] E. H. Carter, "The Interests of Adolescents in Physical, Mechanical-Scientific, and Intellectual-Cultural Pursuits: A Cumulative and Comparative Study" (unpublished Doctoral dissertation, University of California Library, 1939).

[13] R. L. Thorndike, "Constancy of the IQ," *Psychological Bulletin* (1940), **37**, 173.

[14] R. L. Thorndike, "The Effect of the Interval between Test and Retest on the Constancy of the IQ," *Journal of Educational Psychology* (1933), **24**, 547; also (1940), **31**, 170.

[15] A. E. Traxler, "Stability of Scores on the Primary Mental Abilities Test," *School and Society* (1941), **53**, 255–56.

PERMANENCE OF INTERESTS FOR INTERVALS OF FROM ONE WEEK TO TEN YEARS, MEASURED BY CORRELATION BETWEEN TEST AND RETEST SCORES*

Group	Occupational Scale	One Week	One Year		Two Years	Three Years		Five Years	Six Years	Nine Years	Ten Years
		144 College Freshmen[a]	150 High School Juniors	247 College Freshmen	64 High School Sophomores[c]	Average of Correlations from Two Groups of 91 and 97 College Freshmen[a]	76 College Freshmen[b]	223 College Seniors	160 High School Juniors	175 College Freshmen	168 College Seniors[e]
I	Artist	...	...	...	...	...	...	.77	.51	.58	.78
	Psychologist	...	...	...	...	...	...	.79	...	...	...
	Architect	...	...	...	...	...	...	.74	...	...	...
	Physician	.94	.73	.85	...	.66	...	.78	.55	.66	.77
II	Mathematician	...	...	...	...	...	...	.75	...	...	...
	Physicist	...	...	...	...	...	...	.81	...	...	...
	Engineer	.95[e]	.83	.91	...	.78[f]	.85	.84	...	...	.83
	Chemist	...	...	...	.65	...	...	.84	...	...	.81
III	Production manager	...	...	...	...	...	...	...	...	...	.77
IV	Farmer	...	...	...	...	...	...	.81	...	...	.76
	Printer	...	...	...	...	...	...	.74	.46	.47	.66
V	Y.M.C.A. physical director	...	...	...	...	...	...	.71	...	...	...
	Personnel manager	.85	.65	.78	...	.60	...	.62	.51	.45	.51
	Y.M.C.A. secretary	...	...	...	.55	...	...	.67	.53	.50	.57
	Social science teacher	...	...	...	...	...	...	...	...	...	.66
	City school superintendent	...	...	...	...	...	...	.70	...	...	.67
	Minister	...	.68	.79	...	...	...	.64	...	...	.59
	School man	.86	.66	.78	.49	.69	.58	.66	...	...	...

VI	Musician	...	...	...	...	...	...	...	...	...	...
VII	C.P.A.	.84	.55	.62	.57	.66	.60	.59	...	...	.69
VIII	Accountant	...	...	...	...	...	...	...	...	...	.67
	Office worker	...	...	...	.48	...	.59	.74	...	...	...
	Purchasing agent	.93	.77	.81	...	.76	...	.77	.55	.70	.70
IX	Sales manager	...	...	...	...	...	...	...	...	...	.68
	Real estate salesman	...	...	...	...	...	...	.76	...	...	...
	Life insurance salesman	.93	.78	.89	.66	.77	...	.80	...	...	.77
X	Advertising man	.90	.62	.82	...	.75	...	.80	...	...	.79
	Lawyer	.91	.65	.75	.59	.69	.50	.77	...	...	.79
	Author-journalist	...	...	...	...	...	...	.79	...	...	...
Average of 9 scales		.90	.69	.80	...	.79	...	.74	...	...	.72[g]
Average of all scales		.90	.69	.80	.57	.79	.62	.75[h]	.52	.56	.71

* Data for one week and first three years from P. S. Burnham (see note *a*); second three years from Van Dusen (see note *b*); two years from Canning (see note *c*).

[a] P. S. Burnham, "Stability of Interest Test Scores" (unpublished Doctoral dissertation, Yale University, 1935), Table XIX; also "Stability of Interests," *School and Society* (1942), Vol. 55, p. 333.

[b] A. C. Van Dusen, "Permanence of Vocational Interests," *Journal of Educational Psychology* (1940), Vol. 31, pp. 401–24.

[c] L Canning, K. von F. Taylor, and H. D Carter, "Permanence of Vocational Interests of High-School Boys," *Journal of Educational Psychology* (1941), Vol. 32, p. 482.

[d] Revised scales used here; in all other columns old scales used.

[e] Glass reports .92 for a period of one month. See S S. Glass, "An Investigational Analysis of Certain General and Specific Interests of Engineering Students" (unpublished Doctoral dissertation, Purdue University Library, 1934).

[f] Glass reports .71 for 201 engineering students who continued in college and .66 for 85 students who dropped out of college (*op. cit*, Table II).

[g] Minister substituted for school man to constitute the group of nine

[h] When corrected for attenuation this coefficient is increased to .84.

On the other hand, permanence of interests is higher than that of attitudes. For example, Corey reports correlations ranging from .28 (War) to .61 (Church) and averaging .48 for six attitude tests administered to college freshmen and retested a year later.[16]

(E. L. Thorndike reports a correlation of .74 between the interests of men at 25 and at 55 years of age.[17] He speaks of this as "the permanence of the relative strengths of interests." This coefficient is based, as are Thorndike's earlier studies, upon memory for the earlier age. The writer cannot accept interests reported by 55-year-old men which they had at age 25 as equivalent to interests reported at age 25.)

PERMANENCE MEASURED BY MEAN SCORES

Table 96 records the mean standard scores of 168 college seniors of 1927 who were retested five and ten years later. Mean scores increase for about two-thirds of the occupational interests and decrease for the remainder. There are seven statistically significant changes in scores from 1927 to 1932, two such changes from 1932 to 1937, and eight such changes during the ten-year period, 1927 to 1937. Fourteen of the total of seventeen significant changes are increases in mean scores. Bearing in mind that a single blank is scored for 18 occupational interests, we may conclude that mean scores on some scales change significantly but not on other scales and that taking all 18 scores into account the changes are slight, averaging 0.7 standard score in five years.

With younger men the differences in mean scores over an interval of time are greater than with college seniors. This is shown by the data in Table 70 (p. 267), where the average difference on 34 occupational scales of high-school juniors over a period of six years is 3.9 standard score, the average of college freshmen over a nine-year interval is 2.2, and the average of college seniors over a decade is 1.9. Critical ratios have been calculated for enough of these mean differences to indicate that a difference of 2.5 to 3.0 standard score in this table has a critical ratio of 3.0 or more.

[16] S. M. Corey, "Changes in the Opinions of Female Students after One Year at a University," *Journal of Social Psychology* (1940), **11**, 349. None of the changes in mean scores was statistically significant.

[17] E. L. Thorndike, "The Interests of Adults," *Journal of Educational Psychology* (1935), **26**, 408–10.

Using 2.5 as the basis of calculation we have 22 significant differences among 34 with high-school juniors, 11 significant differences with college freshmen, and 12 significant differences with college seniors.

TABLE 96

MEAN OCCUPATIONAL-INTEREST SCORES OF 168 COLLEGE SENIORS TESTED IN 1927 AND RETESTED FIVE AND TEN YEARS LATER

Occupation	Mean Standard Scores			Critical Ratios[a]		
	1927	1932	1937	1927–1932	1932–1937	1927–1937
Accountant	29.9	31.9	32.9	2.8	1.4	4.5
Advertising man	34.5	33.9	34.2	−1.2	0.6	−0.6
Artist	24.6	24.7	24.0	0.2	−1.2	−1.0
C.P.A.	27.9	31.5	31.0	5.2	−0.7	5.4
Chemist	30.9	34.7	34.4	5.0	−0.4	4.2
Engineer	32.4	34.6	34.9	3.2	0.4	3.5
Farmer	34.6	33.0	33.9	−3.1	1.7	−1.3
Lawyer	35.1	35.5	34.2	0.7	−2.2	−1.5
Life insurance salesman	31.4	28.7	28.6	−4.4	−0.2	−4.2
Minister	18.2	16.6	20.3	−2.2	4.7	2.9
Personnel manager	31.9	33.4	36.3	1.9	3.5	5.1
Physician	30.2	31.5	30.6	1.8	−1.2	0.6
President	31.4	33.0	33.6	3.3	1.1	4.0
Printer	32.1	32.3	34.0	0.3	2.4	2.8
Production manager	34.2	36.3	37.9	3.8	2.8	6.4
Purchasing agent	32.8	33.4	33.3	1.0	−0.2	0.8
Sales manager	32.2	31.6	32.2	−0.8	0.8	0
Social science teacher	27.0	27.0	29.0	0	2.5	2.5
Average[b]	30.6	31.3	32.0	...	...	...

[a] Standard deviations are reported in Table 196, p. 722. Correlations between 1927 and 1937 scores are given in Table 95.

[b] Averages for 34 occupational scales are, respectively, 28.4, 29.0, and 29.5 (see Table 196).

Changes in mean scores of occupational scales over the age range of 15 to 45 years have already been considered in Table 70. If the changes in mean scores, which seemingly are to be attributed to increasing interest maturity, were subtracted there would be left relatively little change.

Women's interests.—The only data in our possession regarding the permanence of women's interests are those furnished by Burge-

meister.[18] These pertain to 164 freshman women at Barnard College, mean age of 18.1 (σ .96), who were retested the following year. Mean scores on the occupational scales have changed very slightly—in no case is there a statistically significant difference. Correlations between the two sets of scores range between .63 and .86, with an average of .77 for 16 scales. This correlation approximates that obtained for college freshmen (.80) as given in Table 95.

These college women were also tested twice on the *Lecky Individuality Record*, measuring withdrawal, and the Allport-Vernon *Study of Values*.[19] The correlation between test and retest for the former was .73, and the average of the six correlations for the latter was .69. There is slightly greater consistency in interest scores over the interval of a year than in withdrawal and value scores.

PERMANENCE MEASURED BY CHANGES IN RATINGS

The interest test differs from most tests in that all the high scores are considered practically equivalent and all the low scores are similarly considered practically equivalent, whereas in other tests variations in scores throughout the entire range are significant. It is particularly important in this connection to note how changes of interest over a five- or ten-year period affect the middle range of scores. When a correlation of .74 is obtained, there may be little variation in rank order at the extremes of the two distributions but noticeable variation in the middle of such distributions. If that is the case with our occupational-interest scores, then a correlation for permanence of .74 may be accompanied by many changes in ratings (i.e., scores in the middle range) within the next few years. Is this the case?

Three sets of data are given in Tables 97 to 99, comparing, respectively, the ratings of (*a*) college seniors retested ten years later, (*b*) college freshmen retested one year later, and (*c*) high-school juniors retested six years later.

[18] B. B. Burgemeister, "The Permanence of Interests of Women College Students," *Archives of Psychology* (1940), No. 255.

[19] See Table 93, p. 345, for comparison of these value scores with occupational scores.

TABLE 97

DISTRIBUTION OF OCCUPATIONAL-INTEREST RATINGS OF 168 COLLEGE SENIORS RETESTED TEN YEARS LATER

(Figures are percentages based on 18 occupational-interest scales)

Ratings in 1927	Ratings and Standard Scores in 1937						Totals in 1927
	C 24 and Below	C+ 25–29	B— 30–34	B 35–39	B+ 40–44	A 45 and Above	
A	.1	.2	.4	1.9	2.0	7.4	12.0
B+	.3	.5	1.3	2.3	2.4	3.0	9.8
B	1.2	1.5	2.4	2.7	2.4	3.2	13.4
B—	2.8	2.7	3.6	3.3	1.9	1.4	15.7
C+	5.1	3.2	2.7	2.7	1.0	.5	15.2
C	21.4	5.5	4.0	2.0	.8	.3	34.0
Totals in 1937	30.9	13.6	14.4	14.9	10.5	15.8	100.1

TABLE 98

DISTRIBUTION OF OCCUPATIONAL-INTEREST RATINGS OF 50 COLLEGE FRESHMEN RETESTED THE FOLLOWING YEAR

(Figures are percentages based on 13 occupational-interest scales)

Ratings in 1930	Ratings and Standard Scores in 1931						Totals in 1930
	C 24 and Below	C+ 25–29	B— 30–34	B 35–39	B+ 40–44	A 45 and Above	
A	.3	0	.3	.9	1.9	6.6	10.0
B+	.2	.5	.8	2.8	2.9	2.6	9.7
B	1.1	1.5	3.1	3.2	2.9	1.1	12.9
B—	1.4	3.5	5.1	1.9	1.4	.6	13.9
C+	6.3	4.6	3.7	1.4	.5	.2	16.6
C	29.5	5.5	1.2	.6	0	0	36.9
Totals in 1931	38.8	15.7	14.2	10.8	9.5	11.1	100.0

TABLE 99

DISTRIBUTION OF OCCUPATIONAL-INTEREST RATINGS OF 50 HIGH-SCHOOL JUNIORS RETESTED SIX YEARS LATER

(Figures are percentages based on 13 occupational-interest scales)

Ratings in 1930	Ratings and Standard Scores in 1936						Totals in 1930
	C 24 and Below	C+ 25–29	B— 30–34	B 35–39	B+ 40–44	A 45 and Above	
A	.6	.5	.5	.9	2.2	4.8	9.4
B+	.9	1.2	.5	1.5	1.5	4.0	9.7
B	1.7	1.5	1.9	3.2	1.1	3.5	12.9
B—	4.3	2.6	3.1	3.5	2.2	1.1	16.8
C+	9.9	3.5	2.2	.9	.9	.6	18.0
C	24.3	3.5	2.8	2.0	.5	.2	33.2
Totals in 1936	41.7	12.9	10.8	12.2	8.3	14.2	100.0

Of the 12 per cent of A ratings of seniors in 1927, ten years later, 7.4 per cent were A ratings, 2.0 per cent were B+, and 1.9 per cent were B ratings (Table 97). Evidently if a senior had an A rating there was very little chance of his receiving anything but an A, a B+, or a B rating a decade later. Furthermore, there were 34.0 per cent C ratings in 1927; in ten years these had changed so that there were 21.4 per cent C ratings, 5.5 per cent C+ ratings, 4 per cent B— ratings, and 2.0 per cent B ratings. If a senior had a C rating in 1927, there are 2.3 chances in a hundred that it might be raised to B+ in 1937 and 0.9 chance in a hundred that it might be raised to an A rating. About the same situation exists for college freshmen over a one-year interval (Table 98). But there is evidently greater change for high-school juniors over a six-year interval (Table 99); that is, there are 6.6 chances in a hundred that an A rating may change to C but less than one chance in a hundred that a C rating may change to an A, and there are only 1.9 chances that a C rating may change to a B+ or an A rating.

Another way of summarizing these data is as follows:

Group	Identical Rating	Second Rating within One Step of First	Second Rating within Two Steps of First
High-school junior, six-year interval....	40.5	72.8	88.5
College freshmen, one-year interval....	52.0	86.2	95.9
College seniors, five-year interval.....	45.9	77.5	93.2
College seniors, ten-year interval.....	40.7	72.1	91.4
College seniors, five years later, five-year interval	48.3	82.0	95.6

Roughly there are 45 chances in a hundred that the same rating will be obtained on retest within five years, 75 chances that the same rating or one just above or below it will be received, and 90 chances that the second rating will be within two steps of the first rating.

Somewhat comparable data on 64 high-school sophomores (age 15.7 years) retested two years later are given by Canning, Taylor, and Carter. They compare this group with our college seniors retested five years later. Unfortunately, direct comparison with the data cited above cannot be made because their data are based on the original, not the revised, scales. These authors state:

A boy who received an A rating has a 48 percent chance of receiving the same rating two years later. If he received a C rating, there is an 83 percent chance he will obtain the same rating at the end of two years and there is only a one percent chance that he will receive an A rating. After two years, a retest shows that an A rating will be replaced by a rating of B or higher in 88 percent of the cases, and that a C rating will be replaced by a B rating or lower in 97 percent of the cases.

With reference to Strong's data, there is a 63 percent chance that a college man who received an A rating will receive the same rating five years later; if he received a C rating, there is a 78 per cent chance that he will obtain the same rating five years later, and only a .9 percent chance that he will receive an A rating. After five years, retests showed that A ratings were replaced by B or higher ratings in 98 percent of the cases, and that C ratings were replaced by ratings of B or lower in 96 percent of the cases.[20]

They continue:

Although the constancy of vocational interests of these high school boys was less than that of Strong's college senior men, comparison with studies by Burnham and Van Dusen indicates that the interests of these high school boys were about as constant as the interests of college men tested as freshmen and retested as seniors.[21]

The data in Table 97 are average scores based upon eighteen scales. Tables 100 and 101 present the data for each of these scales separately and make clear that there are appreciable differences among the eighteen scales as to the changes in ratings over a ten-year period. With five of the scales no senior among 168 had an A rating change to B— or lower, and all changes from A to C rating occurred in only three scales. Similarly changes from C to B+ or A did not occur at all on five scales and changes from C to A did not occur on thirteen of the eighteen scales.

The foregoing tables record the actual changes in ratings over periods up to ten years. Table 7 (p. 82) gives the changes in ratings which are to be expected because of the unreliability of the scores themselves. A summary of the two is given in Table 102. It is evident that more widespread changes actually occur than are predicted on the basis of the standard error of measurement. Roughly we may say that 40 per cent of the actual changes are due to unreliability of the scales and 60 per cent to lack of permanence of interests.

[20] L. Canning, K. von F. Taylor, and H. D. Carter, *op. cit.*, p. 490. [21] *Ibid.*, p. 493.

Part of the change is caused by forcing responses into one of three categories (see page 659), part is caused by increasing maturity common to men in general, and part is caused by true shifts in interests because of individual experience. When these factors can be disentangled, it is confidently expected that true changes in interest-test scores because of lack of permanence will be found to be relatively slight.

TABLE 100

RESULTS OF RETEST IN 1937 OF 168 COLLEGE SENIORS WHO RECEIVED A RATINGS IN 1927*

Occupational Scales	Percentage Receiving A Rating in 1927	Percentage of A's in 1927 Rated A or Below in 1937					
		C 24 and Below	C+ 25–29	B— 30–34	B 35–39	B+ 40–44	A 45 and Above
Accountant	8	..	..	14	14	29	43
Advertising man	12	..	..	5	10	19	67
Artist	3	..	..	..	40	20	40
C.P.A.	4	..	..	..	14	29	57
Chemist	24	..	5	..	10	10	76
Engineer	23	..	..	3	13	8	77
Farmer	15	..	..	..	23	27	50
Lawyer	21	..	3	..	17	11	69
Life insurance salesman	12	..	10	..	24	10	57
Minister	0	..	..	..	..	..	..
Personnel manager	11	6	..	..	28	22	44
Physician	15	..	..	12	4	15	69
President	5	..	..	11	33	22	33
Printer	10	..	6	..	18	18	59
Production manager	14	..	..	4	17	12	67
Purchasing agent	12	..	..	..	19	24	57
Sales manager	16	4	4	4	4	30	55
Social science teacher	7	9	..	..	27	..	64
Average	11.9	0.8	1.7	2.5	16.0	16.8	62.2

* See Table 97, p. 365.

Degree of certainty to be attached to A, B, and C ratings.[22]— Burnham concluded in his thesis that "the highest degree of certainty can be attached to the rating of C, somewhat less to B and least to an A rating."[23] Thus 79 per cent of those receiving a C

[22] In this section B includes B+, B, and B—.

[23] P. S. Burnham, *op. cit.*, p. 87.

rating on his first test received a C on the second test three years later, while this was true of only 62 per cent of B ratings and 35 per cent of A ratings. Van Dusen's[24] data support this conclusion; also our data with college seniors based on old scales for an interval of five years and with high-school juniors. But Glass's[25] data on the old scales and our own on the revised scales indicate that A ratings are more stable than B ratings.

TABLE 101

RESULTS OF RETEST IN 1937 OF 168 COLLEGE SENIORS WHO RECEIVED C RATINGS IN 1927*

Occupational Scales	Percentage Receiving C Rating in 1927	Percentage of C's in 1927 Rated C or Above in 1937					
		C 24 and Below	C+ 25–29	B— 30–34	B 35–39	B+ 40–44	A 45 and Above
Accountant	39	49	17	22	9	3	..
Advertising man	18	63	23	3	10	..	..
Artist	52	89	6	6	..	..	..
C.P.A.	46	49	22	18	5	5	..
Chemist	37	68	8	11	11	..	2
Engineer	36	67	13	13	7	..	..
Farmer	20	74	9	12	6	..	..
Lawyer	20	62	32	3	3	..	..
Life insurance salesman	34	82	9	4	4	2	..
Minister	78	69	13	10	5	2	1
Personnel manager	25	43	10	24	7	9	7
Physician	42	71	20	4	3	1	..
President	26	39	16	25	14	7	..
Printer	22	49	22	11	11	8	..
Production manager	21	42	25	28	..	5	..
Purchasing agent	23	46	28	13	10	3	..
Sales manager	27	67	20	7	4	..	2
Social science teacher	45	62	18	9	7	..	4
Average	34.2	62.6	16.1	12.0	6.1	2.3	0.9

* See Table 97, p. 365.

Theoretically both A and C ratings should be more certain than B ratings, since A ratings on the revised scales cover the range from —.5 σ to 3.0 σ and C ratings from —2 σ to —4 σ and in some cases to —5 σ, whereas B ratings cover the narrower range

[24] A. D. Van Dusen, "Permanence of Vocational Interests" (unpublished Doctoral dissertation, University of Florida Library, 1938), Table VIII.

[25] Glass, *op. cit.*, p. 46.

of 1½ sigma from —.5 σ to —2.0 σ. But college students and, even more, high-school students score lower than adult men and so have fewer A ratings; and these A ratings occur for the most part in the lower range of A ratings. It is because of these relatively few A ratings, which are at the same time low A ratings, that A ratings have less certainty than is to be expected and is actually obtained among adult men.

TABLE 102

COMPARISON OF PERMANENCE OF INTERESTS OVER TEN-YEAR PERIOD WITH CHANCE THAT OBTAINED RATINGS WILL VARY BECAUSE OF UNRELIABILITY OF SCALES*

	C	C—	B—	B	B+	A
Percentage of those receiving an A rating in 1927 who received the indicated ratings in 1937	.7	2.0	.9	19.8	17.3	59.4
Chance an obtained A rating would be...	..	...	.1	1.8	13.3	84.7
Difference	.7	2.0	.8	18.0	4.0	—25.3
Percentage of those receiving a C rating in 1927 who received the indicated ratings in 1937	66.6	14.5	10.4	5.8	1.8	1.0
Chance an obtained C rating would be...	86.7	11.8	1.4	.1	...	...
Difference	—20.1	2.7	9.0	5.7	1.8	1.0

* Data based on Table 7 and corresponding data from Table 100. Data in Table 7 are weighted averages; data here are averages of percentages in order to correspond with the data in Table 100.

More data on younger men are needed to establish the exact status of the three ratings. Until then we can safely conclude that there is less likelihood of making an error in prediction if the original rating is a C. This conclusion is similar to those made regarding other psychological tests—better deductions can be made regarding a person who lacks a quality than concerning one who possesses it.

The objective in using ratings of A, B, and C has been to distinguish between "Yes, you have the interests of the occupation" (A), and "No, you do not have those interests" (C), and to throw doubtful cases into the B ratings. Even after ten years it appears there is only one chance in one hundred with college seniors that

an A or a C diagnosis is incorrect, that is, an A becomes a C, or vice versa (see Table 103). But B ratings mean doubt when as-

TABLE 103

THE CHANCE THAT A COLLEGE SENIOR WILL RECEIVE THE SAME OR ANOTHER VOCATIONAL-INTEREST RATING TEN YEARS LATER*

Rating	Percentage Receiving Indicated Ratings in 1927	Percentage of Those Receiving Indicated Rating in 1927 Who Receive the Same or Another Rating in 1937					
		24 and Below	25-29	30-34	35-39	40-44	45 and Up
		C	C+	B—	B	B+	A
A 45 and up.....	11.9	0.8	1.7	2 5	16.0	16.8	62.2
B+ 40-44.....	9.9	3.0	5.1	13.1	24.2	24.2	30.3
B 35-39.....	13.4	9.0	11.2	17.9	20.1	17.9	23.9
B— 30-34.....	15.7	17.8	17.2	22.9	21.0	12.1	8.9
C+ 25-29.....	15.1	33.1	21.9	17.9	17.9	6.0	3.3
C 24 and below....	34.2	62.6	16.1	12.0	6.1	2.3	0.9

* Based on eighteen occupational-interest scores of 168 college seniors, tested twice.

TABLE 104

THE CHANCE THAT A HIGH-SCHOOL JUNIOR WILL RECEIVE THE SAME OR ANOTHER VOCATIONAL INTEREST RATING SIX YEARS LATER*

Rating	Percentage Receiving Indicated Ratings in 1930	Percentage of Those Receiving Indicated Rating in 1930 Who Receive the Same or Another Rating in 1936					
		24 and Below	25-29	30-34	35-39	40-44	45 and Up
		C	C+	B—	B	B+	A
A 45 and up.....	9.4	6.6	4.9	4.9	9.8	22.9	50.9
B+ 40-44.....	9.7	9.5	12.7	4.7	15.9	15.9	41.3
B 35-39.....	12.9	13.1	11.9	14.3	25.0	8.4	27.4
B— 30-34.....	16.8	25.7	15.6	18.4	21.1	12.8	6.4
C+ 25-29.....	18.0	54.7	19.7	11.9	5.1	5.1	3.4
C 24 and below....	33.2	73.2	10.7	8.3	6.0	1.4	.5

* Based on thirteen occupational-interest scores of 50 high-school juniors, tested in 1930 and 1936. Miss Taylor presents similar data for 64 boys tested when 15.9 and 19.9 years of age. Her group was younger than ours and the interval of time is 4 years instead of 6 years. When her Table VI is recast to conform with ours the average difference of the two sets of percentages is 6.7. Her data show greater permanence than ours, i.e., 5.5 per cent of A ratings change to C and C+ ratings instead of 11.7 per cent; 64.0 per cent of A ratings remain A instead of 50.9; 83.9 per cent of C and C+ ratings remain C and C+ instead of 80.5; and 1.4 per cent of C and C+ ratings change to A ratings instead of 1.6 per cent. Her data closely approximate those of our seniors tested five years later (not ten years later as in Table 103). She concludes, "vocational interests, as measured by the Strong inventories, appear to be almost as permanent during high school years as in adult life." See K. von F. Taylor, "The Reliability and Permanence of Vocational Interests of Adolescents," *Journal of Experimental Education* (1942), Vol. 11, p. 85.

signed; they may continue to be B ratings (60 per cent chance) or change to A (20 per cent chance) or to C (20 per cent chance).

The data for high-school juniors tested after six years (Table 104) approximate this showing except that there are seven chances in a hundred that an A rating may become a C rating but there is only one-half a chance that a C rating may become an A rating.

PERMANENCE OF AN INDIVIDUAL'S INTEREST PROFILE

The three preceding measures of permanence have considered how closely the test and retest records upon a single scale have agreed among a group of people. The fourth measure is concerned with how closely the whole profiles of 20 to 34 occupational scores of a single individual agree between test and retest. Such profiles are illustrated in Figures 27 to 30, pages 421–24.

The data given in Table 105 agree very well with those in Table 95 for the same age of subjects and the same interval of time. Evi-

TABLE 105

PERMANENCE OF OCCUPATIONAL-INTEREST PROFILES

(First three sets of data from Finch[a])

N	School Grade	Interval between Tests	Number of Occupational Scales	Range of Correlations	Average r
33	11th	3 weeks	20	—.32 to .99	.86
148	11th	9–21 months	20	—.68 to .99	.83
57	11th	21–35 months	20	—.07 to .99	.81
25	13th	1 year	34	.60 to .98	.84[b]
50	16th	10 years	34	.25 to .96	.75[c]

[a] F. H. Finch, "The Permanence of Vocational Interests," paper read before the American Psychological Association at Ann Arbor, 1935. See *Psychological Bulletin* (1935), Vol. 32, p. 682.

[b] Median is .88.

[c] Two samples of 23 and 27 cases both gave .75.

dently the average high-school junior's interest profile will correlate .86 with a profile secured three weeks later and about .82 with a profile obtained one to three years later. The correlation will be slightly lower (i.e., .75) for profiles from college students when seniors and ten years later. In other words, 50 per cent of

high-school juniors will have profiles which will correlate over .80 with a second profile secured up to three years later.[26]

Taylor and Carter[27] present similar data for 58 high-school juniors who were retested a year later. The fact that their blanks were scored on only twelve scales instead of 20 to 34 scales may have affected the results. As it is, the 58 rho coefficients ranged from —.65 to .99 with a medium of .74. These results are slightly lower than those reported for boys but still highly significant on the average. The presence of a few negative and low positive coefficients stresses the fact that stability of measured interests is not universal.

Finch[28] states that "a casual examination of those individuals [9 among 338] for whom a negative or zero index was observed suggests that permanence is related to definiteness of pattern, and that, when the individual's first test reveals no pronounced interest in any occupational group, scores on a second test, even if administered within a short time, may show little relation to the scores of the first." Some data of the writer suggest that these low coefficients of permanence are attributable to the fact that the students were *required* to take the test and on the test or retest or on both they did not take the matter seriously.

VOCATIONAL INTERESTS LITTLE AFFECTED BY TRAINING AND EXPERIENCE

Several sets of data are presented here to show, first, that men score approximately alike whether they have had little or extensive experience in their vocation, and, second, that training for an occupation has little or no effect upon vocational-interest scores.

Scores not affected by occupational experience.—The data in Table 75 (p. 275) show that 27.5-year-old men actually score 1.4 higher on their own scale than 57.5-year-old men. Among the 29

[26] Carter has recently published three profiles taken a year apart for three high-school boys and concludes: "such evidence as is available shows that the Strong Scales are probably almost, but not quite, as reliable and stable when used at the high school level as when used with adults." See H. D. Carter, "The Development of Vocational Attitudes," *Journal of Consulting Psychology* (1940), 4, 190.

[27] K. von F. Taylor and H. D. Carter, "Retest Consistency of Vocational Interest Patterns of High-School Girls," *Journal of Consulting Psychology* (1942), 6, 95–101.

[28] "The Permanence of Vocational Interests," paper read before the American Psychological Association, Ann Arbor, 1935.

occupations considered in the table there is no appreciable change in score with age in 17 occupations, and some decrease in score with age in 11 occupations, and only among ministers is there an increase in score with age. There is here no justification for the belief that vocational interests are the resultant of long experience in the occupation. By age 27.5 years such interests are as well established as they will be.

Ryan and Johnson[29] report correlations ranging from zero to —.12 between years of experience and interest scores for both salesmen and servicemen when scored on occupational interest scales for these two occupations and when scored on scales differentiating the superior from the inferior members of the two groups. The writer reports a correlation of —.06 between life insurance interest score and years of experience (see p. 487).

The mean scores of college students in four professional courses are compared with the scores of adult men in the same occupations in Table 116 (p. 418). The students in medicine, engineering, and law were tested when seniors or graduate students, and the students in dentistry were tested when they entered the four-year course in that subject. Consequently the dental students had had less training in this profession than the other three groups of students. The data show that these four groups of students average only 3.5 standard scores below the criterion groups. Such a difference may be easily explained on the basis, first, that nonmembers of a criterion group score about 1.5 standard score lower than the criterion group (see p. 649), and, second, that some of these students will drop out and—as those who do score lower on the average than those who do not—the remainder will average somewhat higher a few year later.

The data in Table 110 (p. 394) are in many ways more conclusive. Here we have the scores of college seniors compared with a retest ten years later. All of these 95 men continued in the occupation they had stated was their choice when seniors. Although individuals differ somewhat in their scores on the two occasions, the averages are 46.2 and 46.9. Similar data for 58 college fresh-

[29] T. A. Ryan and B. R. Johnson, "Interest Scores in the Selection of Salesmen and Servicemen: Occupational *vs.* Ability Group Scoring Keys," *Journal of Applied Psychology* (1942), **26**, 543-62. See p. 511 for consideration of their investigation.

men who continued in their occupation from 1930 to 1939 are 46.3 and 48.3. Here there is an increase of two standard scores in nine years—not a statistically significant difference, however.

There is here in these three sets of data, consequently, no warrant for claiming that vocational experience affects interest scores; for professional students with little or no experience score approximately as do men with many years of experience, and a retest ten years later shows only a very slight increase in interest score in their own occupation.

Interest scores not affected by training.—Table 106 presents

TABLE 106

MEAN SCORES OF HIGH-SCHOOL JUNIORS, COLLEGE FRESHMEN, AND SENIORS ON SEVENTEEN OCCUPATIONS*

Occupations	High-School Juniors	College Freshmen	College Seniors
Advertising man	30.8	32.9	34.5
Artist	28.7	24.8	24.6
C.P.A.	22.8	27.0	27.9
Chemist	31.3	29.4	30.9
Engineer	33.3	30.7	32.4
Farmer	42.7	36.1	34.6
Lawyer	31.0	34.6	35.1
Life insurance salesman	28.5	30.7	31.4
Minister	11.6	16.3	18.2
Personnel manager	18.6	28.9	31.9
Physician	33.2	29.9	30.2
President	30.7	29.9	31.4
Printer	38.9	34.5	32.1
Production manager	32.5	33.1	34.2
Purchasing agent	33.9	32.7	32.8
Sales manager	29.4	31.9	32.2
Social science teacher	22.9	28.3	27.0

* The data in this table differ slightly from those in Tables 195 and 196, p. 720, because these are based on all who filled out the test originally, whereas in the latter tables they are based on only those who took both test and retest.

the mean standard scores of college seniors, freshmen, and high-school juniors in 17 occupations. The percentages of C, B, B+, and A ratings of these groups in 34 occupations are given in Table 107. The seniors have had three more years of general training than the freshmen and some of them considerable specific training

TABLE 107

PERCENTAGE OF C, B, B+, AND A RATINGS OF 160 HIGH-SCHOOL JUNIORS, 306 FRESHMEN, AND 285 COLLEGE SENIORS ON 34 REVISED SCALES

(C+ and B− ratings omitted)

Group	Occupation	160 High-School Juniors				306 College Freshmen				285 College Seniors			
		C	B	B+	A	C	B	B+	A	C	B	B+	A
I	Artist	36.3	11.9	8.1	8.8	50.7	9.1	5.2	5.9	50.5	7.7	6.3	4.6
	Psychologist	80.0	3.1	0.6	...	67.0	4.2	3.6	2.9	61.8	9.8	2.8	3.5
	Architect	33.8	13.1	10.6	6.3	50.0	11.4	7.2	4.6	46.3	10.5	7.7	7.4
	Physician	25.0	13.1	16.3	17.5	36.3	11.1	9.2	16.0	41.4	15.1	8.4	14.7
	Dentist	23.8	21.9	18.1	5.0	44.4	10.1	8.2	5.6	49.5	9.8	9.1	7.7
II	Mathematician	45.6	4.4	8.8	3.1	57.8	8.2	4.9	1.0	56.8	5.6	4.2	3.9
	Engineer	23.8	11.9	14.4	19.4	38.9	10.8	9.5	18.6	36.5	8.8	6.7	21.4
	Chemist	27.5	11.9	11.9	13.8	37.6	9.8	10.1	18.0	39.3	9.5	8.8	20.0
III	Production manager	17.5	21.3	16.9	3.8	22.2	19.9	11.4	14.4	23.2	20.4	11.6	13.3
IV	Farmer	1.9	15.0	20.0	43.1	14.1	17.3	16.7	21.6	20.4	15.8	17.2	15.4
	Carpenter	33.8	15.6	8.8	16.9	64.4	8.2	2.6	4.2	67.7	6.0	3.9	3.2
	Printer	5.0	15.6	23.1	25.6	14.7	20.3	17.6	12.4	21.4	20.4	9.5	10.2
	Mathematics-science teacher	26.3	14.4	15.6	7.5	30.7	13.4	12.7	13.7	32 3	14.7	9.5	8.4
	Policeman	18.1	21.9	10.6	11.9	31.4	16.3	6.9	4.9	41.4	7.0	5.6	2.8
	Forest service	40.6	16.3	6.9	6.9	51.0	8.8	4.2	4.6	53.0	9.1	5.3	2.1

V	Y.M.C.A. physical director	46.9	12.5	5.0	2.5	47.4	11.8	4.9	5.2	54.0	10.2	4.2	3.9
	Personnel manager	70.0	5.6	3.8	.6	35.3	14.4	8.2	10.1	27.7	18.2	11.6	9.1
	Y.M.C.A. secretary	76.9	2.5	3.1	1.3	61.1	9.8	4.6	1.6	62.8	4.6	3.9	1.8
	Social science teacher	55.6	6.9	8.1	4.4	38.9	13.7	10.8	9.8	45.3	10.9	7.7	6.7
	City school superintendent	83.8	3.1	...	...	64.7	8.8	3.3	1.3	68.4	6.0	4.9	1.8
	Minister	85.6	...	0.6	...	77.4	3.9	2.0	0.7	73.3	3.2	3.2	0.7
VI	Musician	18.8	18.1	8.8	17.5	31.0	13.4	7.8	14.4	38.9	11.6	9.8	11.9
VII	C.P.A.	58.8	5 0	3.1	1.9	33.7	9.5	4.9	2.9	48.1	10.9	5.6	3.5
VIII	Accountant	44.4	11.3	6.9	1.9	38.9	16.3	10.5	9.8	40.0	9.8	8.4	9.1
	Office man	24.4	15.6	12.5	12.5	18.6	13.7	12.7	22.9	20 4	17.2	15.1	14.0
	Purchasing agent	11.3	23.8	11.3	11.3	22.2	16.0	13.1	14.1	26.7	14.4	12.3	11.9
	Banker	25.6	17.5	6.9	3.8	35.6	14.1	7.2	5.9	47.0	11.9	3.9	3.5
IX	Sales manager	31.3	10.0	7.5	6.3	22.5	18.0	7.5	11.8	28.4	13.0	11.2	13.3
	Real estate salesman	1.3	26.9	32.5	13.8	4.2	27.5	21.6	18.6	8.1	22.5	13.7	22.1
	Life insurance salesman	32.5	13.1	10.0	2.5	27.5	16.3	8.5	11.1	31.2	16.1	10.9	10.9
X	Advertising man	23.1	12.5	10.0	4.4	19.6	13.7	10.8	13.7	17.2	17.2	15.4	12.6
	Lawyer	22.5	20.0	10.0	5.6	17.6	19.6	12.4	19.3	21.4	15.8	10.5	18.2
	Author-journalist	19.4	18.8	15.6	6.9	24.5	15.0	13.1	9.5	23.9	19.6	8.8	7.7
IX	President	23.1	20.6	11.3	4.4	28 1	16.7	10.5	4.2	27.0	19.6	10.9	5.3

in their vocations, yet they have mean scores practically equal to the freshmen. Only in personnel manager is there a difference as great as three standard scores. When A ratings are considered we find six cases in 34 where the percentage differs by as much as 3 per cent. In four of the six—farmer, mathematics-science teacher, social science teacher, and office man—the freshmen score higher than the seniors; in architect and real estate salesman the seniors score higher, but in the latter occupation the situation is reversed if both A and B+ ratings are considered. Surely there is no evidence here that three years of college affect interest scores appreciably.

Interest mean scores and ratings of high-school juniors differ considerably from college freshmen and seniors. On four occupations the high-school boys average higher by at least three standard scores than the college men, and on six occupations they average lower. The high-school boys have a higher number of A ratings in seven occupations and a lower number in fourteen occupations, counting only differences of three per cent and more. We accordingly cannot say that high-school or college men score the higher, although what differences there are are in favor of the college men.

The difficulty in comparing the two groups is that they represent different samplings of young men. The high-school boys score much higher in occupations of Group IV—on the average they have 18.7 per cent of A ratings to 10.2 per cent for freshmen and 7.0 for college seniors. The occupations on which they rate higher than college men have a mean OL score of 53.5 in contrast to a mean OL score of 60.2 for the occupations on which they rate lower than college men. Such differences are what is to be expected; i.e., the high-school boys include many more men belonging to the skilled and semiskilled trades than the college group.

The data on high-school boys indicate nevertheless that there are many such boys with high ratings in nearly all the 34 occupations and in most of these they have had little or no opportunity to obtain appropriate training or experience.

Carter and Jones present evidence that some tenth-grade boys, averaging 15.7 years of age, have interest patterns characteristic of adult men. They conclude: "the profile study of scores of high

school students shows that many high school sophomores have well-developed patterns of interest.[30]

Mather[31] found no gain in home economics teacher interest accompanying student teaching in that subject. The before and after scores of 22 students were 49.5 ± 8.5 and 49.9 ± 8.8. She, however, found a significant increase in such interest scores for 45 students tested when freshmen in 1940 and when sophomores in 1942. The respective means were 45.7 ± 9.5 and 50.4 ± 7.7.

The set of data which seems most to prove a relationship between interest scores and training is reported by Glass, and here the fact seems to be established that the wrong kind of education can cause a decrease in scores. In his thesis 201 engineering freshmen who continued through engineering school averaged 173 raw score (B+ rating) on the old engineering scale as compared with an average score of 127 (B rating) for freshmen who dropped out of college. This is as it should be; that is, students who drop out should score lower than those who continue. But the men who continued in college scored only 83 (B) when seniors, and the men who quit college scored 129 (B+) three and a half years after they entered college! The only explanation Glass could advance for this latter development was that the engineering curricula had had a negative effect.[32]

Walters and Eurich[33] conclude from their investigation:

> If our hypothesis is correct, namely, that the present seniors were, four years ago, what the freshmen of equal intelligence are now, the results argue for a remarkable permanence of interests. . . . . Nevertheless, the results strongly suggest that relative interests of college students, as measured by the Minnesota Interest Blank, are not changed to any marked degree by collegiate experiences, and that by studying the interests of the

[30] H. D. Carter and M. C. Jones, "Vocational Attitude Patterns in High School Students," *Journal of Educational Psychology*, 1938, **29**, 333.

[31] M. E. Mather, "The Use of the Strong Vocational Interest Blank in Predicting the Success of Student Teachers in Home Economics," Master's Thesis, Pennsylvania State College, 1942.

[32] C. F. Glass, "An Investigational Analysis of Certain General and Specific Interests of Engineering Students" (unpublished Doctoral dissertation, Purdue University Library, 1934), pp. 22–29. On page 38 it appears that 75 per cent of the senior engineers, who stated they would not take engineering if they "had it to do over again," had C ratings in engineer interest.

[33] A. Walters and A. C. Eurich, "A Quantitative Study of the Major Interests of College Students," *Journal of Educational Psychology* (1936), **27**, 561–71.

freshmen we may predict to a limited extent what his relative interests as an upper classman may be.

It is possible that the crudeness of the interest inventory has obscured some of the interest changes which might have taken place between the freshmen and senior years. Future research, therefore, must be directed toward the development of an adequate technique for measuring the intensity of an interest as well as its presence or absence.

Conclusion.—Vocational interests found among college students and to a lesser degree among juniors and seniors in high school cannot be attributed to formal training or experience in those pursuits. Hence it appears that the interests characteristic of occupational groups are present to a large degree prior to entrance into the occupation and so are presumably a factor in the selection of the occupation.

Chapter 16. Prediction of Future Occupational Satisfaction

To what extent can a man's future occupational career be predicted on the basis of his vocational-interest scores?

Interests, we have seen in the preceding chapter, are permanent enough and sufficiently unaffected by vocational training and experience to furnish a basis for the prediction of future behavior. The question remains: Will a youth who has responded to the interest items in a fashion similar to that of men engaged in a given occupation later on in life really enjoy that occupation? The test we employ has not been in existence long enough to make it possible to follow up the careers of students for twenty to thirty years and so to determine the relationship between interest scores when in school and adult achievement. The best that can be done here is to present certain data based upon nine- to ten-year follow-ups of college freshmen and seniors and to show the relationship between scores obtained when in college and occupations engaged in later on. Such material constitutes the main part of this chapter.

CRITERION OF A VOCATIONAL-GUIDANCE TEST

The criterion of a vocational-guidance test is not that of vocational counseling, although the two are frequently confused. A test is a tool; its validity is an expression of how well it performs the function for which it was designed. Vocational counseling, on the other hand, must take into account many more or less unrelated factors; its success cannot be measured in terms of any single consideration. Tests may reveal unusual ability and interest in medicine; but if the man has no money, for example, either medicine must be abandoned or plans must be made to work for a period and save the necessary funds. In other words, counseling involves compromises; many factors must be weighed and a pro-

gram worked out that fits best the total situation. Such compromises represent the presumably best program, taking the future into account; they may not be particularly appealing in the immediate present.

Probably the most commonly used criteria for both tests and counseling are the choice of the counselee, the opinion of the counselor regarding the counselee's choice, and the opinion of the counselee regarding the counselor. Students, counselors, and business men accept or reject a test score surprisingly often according to whether or not it agrees with their own opinion. The evidence is ample, however, that, while choices of some students are quite stable, others may change very shortly. In consequence it is impossible to expect high agreement between any good vocational-guidance test and occupational choice. But, since such choices have some significance, it is to be expected that a good test will agree to some extent with occupational choice of students.

Other criteria that have been proposed for both vocational counseling and vocational tests are: earnings, job performance or efficiency, level of work done, job satisfaction, realization of potentialities, and the like. These criteria may be reduced fairly well to two—success and satisfaction; that is, how has the man succeeded in the eyes of his fellows? and how well satisfied is he himself? The two are of course related—one must be reasonably successful in some respect to be satisfied. But, as pointed out in chapter 1, the kind of success a given man needs to sustain his satisfaction may not be the kind of success his fellows desire of him.[1]

It is a real question how far success should be used as a criterion of counseling. Fifty per cent of the people will always be less successful than the average. This means that counseling measured on the basis of success will always appear rather ineffective. Viteles' concept of the extent to which the individual has realized his capacity for vocational success[2] is to be preferred to a measure of

[1] Since this statement was set down, Lurie has factor-analyzed many criteria and has classified them under the three heads of experience, job level or job satisfaction, and ease in finding employment. His "experience" can just as well be called success, and his second factor is satisfaction. W. A. Lurie, "The Concept of Occupational Adjustment," *Educational and Psychological Measurement* (1942), **2**, 3-14.

[2] M. S. Viteles, "A Dynamic Criterion," *Occupations* (1936), **14**, 962-67. See also E. G. Williamson and E. S. Bordin, "The Evaluation of Vocational and Educational

mere success, but it will be some time before such a concept can be reduced to the statistical basis that a criterion must have.

"Final vocational choice" has been considered a criterion of vocational counseling. Three objections may be raised against such a criterion. First of all, it cannot be assumed that every man eventually enters the occupation for which he is best fitted. If this were true there would be no need for vocational tests, although even then the use of tests might save some men several years of fumbling around. A second objection to ultimate vocational choice as a criterion is that it would be necessary to wait until a former student is dead before measuring the validity of the counseling. This is a serious drawback to the scientific development of counseling. A third objection is that men grow like shrubs: as long as there is life, there is change. What is best for a man today is not necessarily what is best for him tomorrow. Take the case of a man the world has called successful—a machinist in his twenties, a foreman in his thirties, then a plant superintendent, and president of the company. A few years after retirement he became a banker, and was rated at his death one of the outstanding bankers of the country. Should the tests used in counseling him and the counseling itself be evaluated in terms of his ultimate occupation of banking? Is there any proof that he would have been a national leader in banking if he had entered a bank right from school? Was it not his first-hand knowledge of business that made him an outstanding banker?

Just as we have abandoned the notion that somewhere in life there is a perfect job for everyone, so we must abandon the notion that there is a single criterion throughout life for counseling. Instead we should say that if a man is satisfied and happy for a time, then counseling that has helped put him in that situation is good counseling. Later he will need further counseling, and again the measure of the counseling is how satisfied and happy he is for the next period in his life. Our answer to the question raised above is that if the counseling indicated "machinist" and he became a satisfied man in that work, the counseling was good. If later he chooses to become something else, the fact does not nullify the value of the

Counseling: A Critique of the Methodology of Experiments," *Educational and Psychological Measurement* (1941), **1**, 5–24.

original counseling unless that change makes clear that the earlier decision was wrong and it now must be rectified. Actually counseling of students in terms of their ultimate jobs would be fruitless in most cases. The man who is to become president of a business needs not merely that knowledge when a boy but also the information as to what job he can do and will enjoy doing in the immediate future.

Counseling has then a twofold criterion—first, to map out the general direction the man should go and, second, to route him over the first part of the journey. But as there are many routes to the same distant goal the counselor should balance the more direct routes against the more satisfying routes for that counselee.

Criterion of a vocational-interest test.—A vocational-aptitude test purports to measure degree of performance in a given "trait," and a trade test measures proficiency in a job. Naturally the criteria for these two kinds of tests should be what these tests purport to measure. It is here that success is rightfully a criterion.

The criterion of a vocational-interest test should be whether or not the person will be satisfied in the career to which it directs him, other factors than interest being disregarded. Our data indicate that interest-test scores express future efficiency to some extent, which is very fortunate; but the interest test is not constructed for that purpose and should not be evaluated on that basis. Its validity should be measured in terms of interest or of satisfaction in the work. Moreover, it should be measured in terms of satisfaction not while the person is preparing for the work but later on while he is actually engaged therein.[8] (The scoring procedure indicates whether or not one has the interests of men who are employed in the occupation.)

There are at least three pertinent objections to using satisfaction as a criterion: First, dissatisfaction may be caused by conditions peculiar to a particular job and not to the work per se. Thus an unpleasant superior, noncompanionable associates, an

[8] An analysis of one hundred cases from files of the University of Minnesota Testing Bureau indicates that "adults who complain of occupational dissatisfaction show, in general, measured interest patterns which are not congruent with their present or modal occupation." See T. R. Sarbin and H. C. Anderson, "A Preliminary Study of the Relation of Measured Interest Patterns and Occupational Dissatisfaction," *Educational and Psychological Measurement* (1942), **2**, 35.

economic depression, and the like may cause a man to feel the work itself is unsatisfactory. Second, from the social point of view it might be argued that man should not be too satisfied; there is some evidence that maladjustment is a motivating force which seemingly explains the careers of some of our geniuses. Third, at the present time we do not have adequate measures of satisfaction against which we can check. But that does not mean that such measures cannot be obtained in the future, although we suspect that good measures will involve careful research. Despite these objections the writer can think of no better criterion for a vocational-interest test than that of satisfaction enduring over a period of time.

Since the *Vocational Interest Blank* scales express the relationship between the average man in the occupation and the average man-in-general, the criterion of such a test is not high degree of satisfaction but "reasonable" satisfaction in contradistinction to dissatisfaction. Few men are 90 to 100 per cent satisfied with their occupations, and none of these men maintains that fever heat of satisfaction continuously. All that can be expected is that one is reasonably satisfied, with fluctuations in the degree of that satisfaction from time to time.

If we had a scale ranging from —100 (extreme dissatisfaction) to +100 (extreme satisfaction) reasonable satisfaction might be defined as the range from about 25 to 100. The criterion is in other words reasonable satisfaction, opposed to sheer indifference and actual dissatisfaction. It is possible that we have here a situation resembling that of our occupational scales, where a small percentage of the criterion group score below zero raw score. Seemingly among men successfully engaged in an occupation there are some who possess degrees of satisfaction ranging between +25 and —25 on the satisfaction-dissatisfaction scale and who at the same time are not aware of their lack of positive satisfaction. The writer has been struck with the fact that many men in their thirties and even forties who appeal to him for help were presumably only slightly satisfied or even mildly dissatisfied for a long time but were getting along all right as far as they were aware. Then one day such a man discovered that some friend was finding far more enjoyment in his work than he was. The contrast

focused attention upon his own situation, and from that time on he became increasingly disturbed concerning it. His status changed from low satisfaction or dissatisfaction to distinct dissatisfaction.

The argument for inclusion in the criterion of a low degree of satisfaction is twofold. First, some borderline cases are quite successful in their work even though they do not have the thrill that better-satisfied men experience. And, second, there is no virtue in setting the degree of satisfaction for our criterion so high that all within the range are so satisfied that they do not ever shift to any other occupation. Just as half of the men in an occupation will always fall below the average in proficiency, so half (not necessarily the same individuals) will possess rather low satisfaction. To argue otherwise is to claim that for every man there is an occupation perfectly designed for him, which we are sorry to admit we do not believe any more than that every man starting in a race will win first place. But when we use the criterion of reasonable satisfaction we recognize that there are men in all walks of life who are only lightly satisfied with their work but who may discover other work still more satisfying and shift to it. This brings us back to the point made above, that our criterion must be twofold, part pertaining to the general direction to be pursued and part pertaining to the route to be pursued in the immediate future. If a man is progressing as he goes along in life and is reasonably satisfied, he is well adjusted vocationally. When counselors can meet that standard, better criteria can be considered.

We have attempted to validate our interest test by proving, first, that those who are satisfactorily adjusted in an occupation may be differentiated by the test from those who are not satisfactorily adjusted, and from those not engaged in the occupation; and, second, that those young people who obtain scores comparable to the satisfactorily adjusted group enter that occupation in reasonable degree and those who do not obtain such scores enter other occupations. We cannot expect to obtain correlations of 1.00 in this respect, because economic conditions do not permit complete freedom of choice.

Since it has already been amply demonstrated that the interest test does differentiate one occupation from another, we need con-

cern ourselves here with only the second phase of the program stated above, that is, the demonstration that a high percentage of students enter the occupation in which they score highest on the interest test.

In such a validation as we are here engaged in, it is necessary to assign the student, first, to an occupation on the basis of his interest-test scores[4] and, second, to an occupation on the basis of what constitutes satisfactory adjustment for him. The validity of the test is the degree to which these two measures agree.

Because we had no adequate measure of satisfaction in their work of the men in the follow-up studies to be reported below, we have been forced to content ourselves with assuming that "continuance in an occupation" is a measure of "satisfactory adjustment." The criterion of "continuance" has the merit of definite objectivity—it is possible to know whether a man is employed in the occupation or not. The criterion of "continuance in an occupation" cannot be accepted as equivalent to that of "satisfactory adjustment," as we all know too many cases of men who dislike their work but cannot quit.[5]

In these follow-ups an attempt was first made to assign a man to an occupation only when all additional information indicated he was in the occupation of his choice. But this led to the necessity of making so many varied subjective judgments that the endeavor was given up. In consequence a man has been assigned in the five- and ten-year retests to the occupation in which he is engaged except

[4] Guidance should not be given merely in terms of the highest interest score; see chapter 17. After many attempts to assign men to an occupation based on their whole interest profile, the procedure was abandoned for the much simpler one of utilizing only the highest interest score. The former procedure seemingly necessitated assigning a man to several occupations if he has several scores of about the same size. No satisfactory way of handling such data occurred to us.

[5] Sarbin and Anderson have recently published some data which support this hypothesis: "Adults who express dissatisfaction with their current occupations show no primary pattern of interest, as measured by the Strong Vocational Interest Blank, for the group of occupations in which their current ocupation belongs." This they find to be true of 82 per cent of 76 men and 58 per cent of 24 women, who constituted the one hundred cases of adults which they had followed up. Their finding lends support to the validity of our third hypothesis but not proof, since it is one thing to find dissatisfied adults without appropriate interests and another thing to have satisfied adults who possessed appropriate interests earlier in life. See T. R. Sarbin and H. C. Anderson, "A Preliminary Study of the Relation of Measured Interest Patterns and Occupational Dissatisfaction," *Education and Psychological Measurement* (1942), **2**, 23-36.

when additional evidence has made clear that he actually intends to do something else very shortly. We believe two types of errors in these studies largely balance each other. The interest test appears poorer than it really is because some men not in the occupation indicated by their interest scores are anxious to enter that occupation but for one reason or another cannot do so. The test appears better, on the other hand, than it really is because some men in the occupation indicated by their interest scores are not satisfied and will change if they can.

In 1932[6] we set up the following four propositions as measures of the predictive value of the vocational-interest test:

1. Men continuing in occupation A obtain a higher interest score in A than in any other occupation.
2. Men continuing in occupation A obtain a higher interest score in A than other men entering other occupations.
3. Men continuing in occupation A obtain higher scores in A than men who change from A to another occupation.
4. Men changing from occupation A to occupation B score higher in B prior to the change than in any other occupation, including A.

How well these four propositions are upheld by five-year and ten-year follow-ups is reported below.

TWO FOLLOW-UP STUDIES

The discussion which follows is based upon a ten-year follow-up of senior men at Stanford University in 1927 and a nine-year follow-up of freshmen in 1930. In 1935 the author reported a five-year follow-up of the seniors.[7] Conclusions from the ten-year follow-up agree very well with the five-year follow-up.

In 1927 all the seniors at this institution were requested to fill out the *Vocational Interest Blank* and a questionnaire regarding their occupational plans. Slightly over two-thirds complied, a total of 287 men. In January 1928, March 1932, and March 1937 varying numbers reported their occupational progress, giving thereby a remarkably full record of the jobs held and the occupational plans in mind. In many cases very enlightening comments

[6] E. K. Strong, Jr., "Predictive Value of the Vocational Interest Test," *Journal of Educational Psychology* (1935), **26**, 331–49.

[7] E. K. Strong, Jr., *op. cit.*, 1935.

were included regarding present position and future program. In addition, in March 1932 and March 1937 many of these men filled out a second and a third *Vocational Interest Blank*. The five-year follow-up is based on 223 men who filled out the blank in 1932, and the ten-year follow-up is similarly based on 197 men who filled out the blank in 1937.

In 1930 most of the freshmen were given the opportunity to fill out the *Vocational Interest Blank* in return for their scores on all scales then available. Three hundred and six freshmen did so. In 1939 these freshmen were requested to fill out the blank a third[8] time, again with the understanding they would receive their scores on the revised scales for both 1930 and 1939, with the result that 174 blanks were received. At that time each filled out also a questionnaire regarding his educational and occupational career.

Determination of occupational choice.—In order to check vocational-interest scores against subsequent careers it is necessary to assign an occupation to each man. Shall it be on the basis of what he is doing or on the basis of what he states he is planning to do? There is no question that the latter procedure must be followed when dealing with students. Should we continue on this basis when dealing with men no longer in school, or shift to the more objective basis of "occupation engaged in"? For example, a senior states in 1927 he does not know what occupation he will enter. In 1928 he says he wants to be an author but is working as an accountant. In 1929 he repeats this. In 1932 he is an accountant but states he still doesn't know whether he will continue in that occupation or do something else. In 1937 he is still an accountant but complains of the small income and states in positive language that when he has saved some money he intends to buy a ranch. In the five-year follow-up we proceeded on the basis that occupational progress should refer to the occupational *choice* expressed by our subjects when they were seniors (1927 data) but should refer to "occupation engaged in" in connection with the 1932 data.[9] In the example given, the senior was classified as

[8] They had been similarly requested to do this when they were sophomores.

[9] In a few cases exceptions were made when it was clear that the occupation engaged in was definitely temporary in nature, as for example work done to earn money to *return* to school.

"Don't know" in 1927 and as "Accountant?" in 1932—the question mark after accountant meaning he was not sure.[10]

In the ten-year follow-up discussed below, we made use of all the information obtained during those years and assigned the "Don't know" seniors to an occupation when that occupation[11] agreed either with what they said in 1927 they might do or with what in 1928 they actually did do. When intention and performance disagreed, particularly when performance in 1927–1928 was not long continued thereafter, it was deduced that the senior did not know what he was going to do. The following tabular material outlines the handling of many of these cases—the "?" means "Don't know what occupation I shall enter."

1927	1928	Occupations in Which Employed	Classification
?	No report	[Immaterial]	Don't know
?	?	[Immaterial]	Don't know
?	Sure	Occupation he is sure of, not that of 1927	Don't know
?	Sure	Occupation he is sure of, that of 1927	That occupation
Sure	?	Occupation he is sure of, not the one engaged in in 1928	Don't know
Sure	?	Occupation he is sure of, the one he is engaged in in 1928	That occupation
No report	Sure	Occupation he is sure of, changed shortly afterwards	Don't know
No report	Sure	Occupation he is sure of, continued in	That occupation

Study of all the data has led the writer to the conclusion that a considerable number of seniors state they "don't know" what occupation they are going to enter when their subsequent actions suggest they do know to some degree at least. Some men state they "don't know" meaning thereby they do not know what company they are going to work for when nevertheless they have a fairly good idea what function they wish to perform. Consequently when a man has continued in a function for years it seems appro-

[10] In each follow-up the man was asked whether or not he was sure of his choice.

[11] In many cases one or more occupations were reported but with remarks indicating "don't know."

priate to assign him to that function early in his career, since his actions seemingly belie his words. Secondly, there seems to be a distinct tendency for those planning to enter an occupation which has lesser social approval to report "don't know" rather than to state that program. Consequently, it seems fair to classify a man as a grocer who stated as a senior he "didn't know" but immediately took over his deceased father's grocery store and has been so engaged ever since. Thirdly, there seems to be a distinct tendency for young men who later enter their father's business to claim they don't know what they are going to do. It is not clear whether they don't like to admit this fact while still in college, or are not sure whether they will immediately start working for father, or do not know the kind of work they will perform for father. The facts are that some immediately go to work for their fathers; others work elsewhere for a year or two. The former are classified in terms of the position they have held with their fathers; the latter have not been so grouped unless they had gone to work with their fathers by 1928.

In this connection one may adhere strictly to "occupation engaged in" or stated "preference" as one's criterion. The latter are objective in the sense that the information is recorded in writing. Many statements, however, are surcharged with subjective feeling and chaotic thinking, and there is no good way of distinguishing between fact and fancy. In consequence we have taken a middle ground, endeavoring to establish as criterion the occupation actually pursued but taking into account what the man has done during the decade and what his plans are for the future. In our opinion it is ridiculous to classify a man as a service-station employee when it is clear that he is staying out of college in order to earn money to continue his medical training. "Don't know" statements have been discarded when subsequent events indicated the man knew far more than his mere statement would imply.

To repeat, for the five-year follow-up, the occupational classification in 1927 was based upon what the men said they wanted to do and in 1932 upon "occupation engaged in." For the ten-year follow-up the classification in 1927 was based upon what the men said in both 1927 and 1928 coupled with what they actually did. The classification in 1937 was "occupation engaged in," but here

as well as in the five-year follow-up, such classification was modified in the light of all the evidence.

Permanence of occupational choice.—Five years after graduation 48 per cent of the seniors had not changed their occupational choice, 9 per cent had made what appears to be a rather slight change, 22 per cent had made a real change, and 21 per cent had changed from "don't know" to a specific choice.

The data from the ten-year follow-up (Table 108) yield about the same conclusions as those from the five-year follow-up. On the

TABLE 108

PERMANENCE OF OCCUPATIONAL CHOICE OF COLLEGE SENIORS DURING TEN YEARS

Group	Number	Percentage
No change in occupational choice		
Sure	99	50.3
Not sure	17	8.6
Total	116	58.9
Change in occupational choice		
Sure in 1927–28 and 1937	41	20.8
Not sure in either 1927–28 or 1937	40	20.3
Total	81	41.1

basis of both studies it may be concluded that about three-fifths have not changed their occupational program, about one-fifth have changed from one occupation to another, and about one-fifth were uncertain in 1927, and many of them are still uncertain in 1937 what their occupation is to be.

The data for 174 college freshmen who have been followed up for nine years yield somewhat different results (Table 109), largely because "business" has here been considered a single occupation, whereas usually subdivisions of business are considered separately. On this basis 69 per cent have continued in the occupation of their choice, or one very closely related to it, over a nine-year period. The low percentage of 7 for those reporting "don't know" is only one-third that for our seniors. As we have pointed out above, "don't know" has many different connotations and pre-

sumably the term is used by the freshmen in a sense different from that used by the seniors.

TABLE 109

PERMANENCE OF OCCUPATIONAL CHOICE OF 174 COLLEGE FRESHMEN DURING NINE YEARS

Group	Percentage		
	Sure	Not Sure	Total
No change in occupational choice	19	25	44
Business—business	6	13	19
Change in choice			
Within same occupational-interest group	1	5	6
To another group	4	20	24
"Don't know" in 1930	..	7	7

From 101 cases who filled out the *Vocational Interest Blank* in 1924, Dyer[12] obtained in 1935 information about vocational careers from 89 men and retest blanks from 62. Her data have apparently not been handled in quite the same way as our own, which may or may not explain the fact that she reports higher permanence of occupational choice than we do: "At the end of ten years 73 percent were engaged in choice No. 1 made as seniors; 11 percent in choice No. 2; 2 percent in choice No. 3; and 13 percent at vocations not listed as choices ten years earlier."

THE TEN-YEAR FOLLOW-UP OF COLLEGE SENIORS

This study is based on the records of 197 men who were college seniors in 1927 and were retested in 1937. The entire group has been subdivided into four subgroups (see Table 108).

No change in occupational choice.—Data concerning 95 of the 116 men who made no change in their occupation are given in Table 110. There is no way of scoring for the occupations the remaining 21 men have entered, and consequently these cases are merely listed at the bottom of the table.

[12] D. T. Dyer, "The Relation between Vocational Interests of Men in College and Their Subsequent Occupational Histories for Ten Years," *Journal of Applied Psychology* (1939), **23**, 283. See also J. R. Dyer, "Sources and Permanence of Vocational Interests of College Men," *Journal of Applied Psychology* (1932), **16**, 233–40, which reports a five-year follow-up of these cases.

On the average there has been no appreciable change in interest scores during the ten-year period for the 95 men—the average standard score in their occupation was 46.2 in 1927 and was 46.9 in 1937; the difference is insignificant, having a critical ratio of 0.8. Evidently ten years' experience in an occupation does not have any appreciable effect upon interest scores in one's own occupation.

TABLE 110

OCCUPATIONAL CHOICE AND INTEREST SCORES OF 95 SENIORS WHO DID NOT CHANGE THEIR OCCUPATION FROM 1927 TO 1937*

N	Occupational Choice in both 1927–28 and 1937	Standard Score			Median of Rank Order			Sure	Not Sure
		1927	1937	Difference	1927	1937	Difference		
1	Psychologist	58	52	—6	1.5	1.0	.5	1	..
18	Physician	50	52	2	1.2	2.3	—1.1	18	..
27	Engineer	44	45	1	3.0	4.4	—1.4	25	2
10	Chemist	53	53	0	1.8	2.5	—.7	9	1
1	Production manager	38	49	11	5.0	2.5	2.5	1	..
1	Farmer	35	29	—6	7.0	10.0	—3.0	1	..
1	Teacher, physical science	39	43	4	7.0	6.0	1.0	1	..
2	Teacher, social science	22	27	5	16.0	14.8	1.2	..	2
2	School man	44	42	—2	4.0	7.5	—3.5	2	..
1	Minister	23	46	23	16.0	2.0	14.0	1	..
1	Accountant	45	38	—7	3.5	8.5	—5.0	..	1
2	Office man	51	41	—10	1.5	9.3	—7.8	1	1
1	Banker	37	48	9	6.5	3.0	3.5	1	..
2	Salesman	56	51	—5	1.0	1.0	0	2	..
1	Real estate salesman	45	40	—5	1.0	1.0	0	1	..
1	Life insurance salesman	52	62	10	3.0	1.0	2.0	1	..
1	Advertising man	54	56	2	1.0	1.0	0	1	..
18	Lawyer	46	46	0	2.3	2.3	0	14	4
3	Author-journalist	47	46	—1	2.0	4.0	—2.0	2	1
1	President	29	38	9	9.0	6.5	2.5	1	..
	Average, Standard score	46.2	46.9	0.7	....	....	....	..	..
	Median, rank order	....	....	....	2.2	2.8	—0.6	..	..

* Occupations which cannot be scored: 4 geologist, 3 zoölogist, 1 entomologist, 2 teacher of physical education, 2 college professor, 2 retailer, 2 wholesale grocer, 2 salesman, 1 oil business, 2 investment business.

It is important to know not only the score obtained but also the relationship between it and other occupational-interest scores, for presumably one is best fitted, as far as interests go, in the occupation in which one scores highest. Accordingly, the score in one's

own occupation has been ranked according as it is highest, second highest, etc., among twenty-three occupations.[18] The psychologist listed in Table 110, for example, obtained a standard score in 1927 of 58 in both psychology and chemistry and his score in psychology was accordingly ranked 1.5; in 1937 his standard score of 52 in psychology was the highest score he received and it was consequently ranked 1.0. For the entire group of 95 cases the score in the occupation chosen by each man averaged 2.2 in 1927 and 2.8 in 1937. (This difference has a critical ratio of 1.5.)

Offhand median ranks of 2 to 3 seem a little low—seemingly the average man should score higher in his own occupation than in any other. To show what is involved, Table 111 is presented,

TABLE 111

1927 STANDARD SCORES EQUAL TO OR GREATER THAN THOSE OBTAINED IN CHEMIST BY 9 SENIORS CHOOSING CHEMISTRY AS THEIR OCCUPATION

Code Number of Individual	Rank of Chemist Score	Physician	Mathematician	Engineer	Chemist	Production Manager	Farmer	Mathematics-Physical Science Teacher	Sales Manager	Real Estate Salesman	President
28...	7	..	..	43	36	48	41	..	41	37	43
50...	2	..	..	62	61	..	..	..	..	..	..
94...	1½	54	..	..	54	..	..	..	..	..	..
116...	2	..	..	62	55	..	..	..	..	..	..
135...	1½	..	54	..	54	..	..	..	..	..	..
151...	2	..	..	..	49	..	55	..	..	..	..
193...	1	..	..	..	52	..	..	..	..	..	..
235...	1½	..	..	..	52	..	..	52	..	..	..
257...	1	..	..	..	69	..	..	..	..	..	..

listing all the standard scores equal to or larger than that obtained in chemist by nine seniors who chose chemistry as their occupation and have continued therein up to 1937. Chemist scored highest in two cases, was tied or practically tied for first in four cases, was second in two cases (with engineer first in one case and farmer first in the other), and was ranked seventh in the ninth case (No. 28) in which production manager scored highest and engineer and

[18] The ranking was restricted to 23 occupations because there happened to be representatives of only these 23 occupations among the 197 cases.

president were tied for second place. In every one of the nine cases chemistry was a good occupational choice as far as all the interest scores are concerned. Even in the case of No. 28, whose chemist score was only seventh highest, the choice of chemist was a good starting place to work up to production manager (highest score) and president (tied for second highest score), although the choice of engineer with a score tied for second place would appear to have been a better choice. Evidently when one enters an occupation in which he scores second highest, he is making a very good occupational choice as far as can be determined from the occupational-interest scores.

Those "sure" and "not sure" of their occupational choices have been segregated and summaries of the two groups are presented in Table 112. Certainty of occupational choice is accompanied by higher standard scores—the sure group averaging 7 to 11 standard scores higher than those who were not sure of their choice in 1927–28 or in 1937 or in both.

Change in occupational choice.—Of the 81 cases who changed their occupational choice between 1927–28 and 1937, 30 can be scored for their occupational choice in both 1927–28 and 1937, 15 more can be scored for their occupational choice in 1927–28 but not in 1937, and 18 can be scored in the reverse manner, leaving 18 who have chosen occupations both times for which we cannot score (see Table 113; also Table 112, which gives the totals for the "sure" and "not sure" subgroups).

Vocational-interest scores change somewhat more in ten years for those who change their occupation than for those who do not. The 1927 occupational choice has a standard score of 44.1 in 1927 and of 40.5 in 1937, which means that, on the average, one scores 3.6 higher in an occupation one is planning to enter than in the same occupation ten years later after one has abandoned it (critical ratio of difference is only 2.5). Conversely, one scores in 1937 3.8 higher (44.5–40.7) in an occupation one is now engaged in than in the same occupation ten years earlier which one had not yet chosen. In terms of rankings of occupational scores, one's 1927–28 occupational choice declines from 2.9 to 5.0, while one's 1937 occupational choice remains about the same (4.2 to 4.1). The same phenomenon was noted in the five-year

TABLE 112

OCCUPATIONAL CHOICE AND INTEREST SCORES OF 141 SENIORS

Change or Not in Occupational Choice	Sure or Not of Occupational Choice	Occupational Choice Made in 1927							Occupational Choice Made in 1937						
		N	Standard Score			Median Ranking of Occupational Choice			N	Standard Score			Median Ranking of Occupational Choice		
			1927	1937	Difference	1927	1937	Difference		1927	1937	Difference	1927	1937	Difference
No change	Sure in '27–'28 and '37	86	46.6	48.0	1.4	2.2	3.1	—0.9							
	Not sure in '27–'28	10	35.5	37.0	1.5	4.3	6.8	—2.5							
	Not sure in '37	8	39.4	38.3	—1.1	3.0	9.0	—6.0							
	Sure and Not sure	95	46.2	46.9	0.7[a]	2.2	2.8	—0.6[b]							
Change	Sure in '27–'28 and '37	32	44.9	40.8	—4.1	2.6	4.8	—2.2	25	38.8	43.8	5.0	4.5	4.1	0.4
	Not sure in '27–'28	9	37.3	36.6	—0.7	8.0	8.0	0	20	43.4	45.4	2.0	3.9	3.3	0.6
	Not sure in '37	6	41.0	38.2	—2.8	6.0	9.3	—3.3	11	37.3	42.0	4.7	5.1	5.5	—0.4
	Sure and Not sure	45	44.1	40.5	—3.6[c]	2.9	5.0	—2.1[d]	48	40.7	44.5	3.8	4.2	4.1	0.1
Total		140	45.3	44 8	—0.7[e]	2.6	3.8	—1.2[f]							

[a] Difference of 0.7 has a critical ratio of 0.8.
[b] Difference of 0.6 has a critical ratio of 1.5.
[c] Difference of 3.6 has a critical ratio of 2.5.
[d] Difference of 2.1 has a critical ratio of 2 5.
[e] Difference of 0.7 has a critical ratio of 0.8.
[f] Difference of 1.2 has a critical ratio of 2 9.

TABLE 113

OCCUPATIONAL CHOICES AND INTEREST SCORES OF 63 SENIORS WHO CHANGED THEIR OCCUPATION BETWEEN 1927–28 AND 1937*

Occupational Choice in 1927	Standard Score			Median Ranking of Occupational-Interest Score			Occupational Choice in 1937	Standard Score			Median Ranking of Occupational-Interest Score		
	1927	1937	Difference	1927	1937	Difference		1927	1937	Difference	1927	1937	Difference
Engineer	33	14	—19	10.0	21.5	—11.5	Production manager	49	33	—16	4 5	10.0	—5.5
Engineer	34	49	15	7.0	3.0	4.0	Physicist	16	46	30	22.0	4.0	18.0
Engineer	29	53	24	16.5	2.0	14.5	Teacher, mathematics-science	31	39	8	11.5	8.0	3.5
Engineer	63	63	0	1.0	1.0	0	Teacher, mathematics-science	40	48	8	6.0	4.5	1.5
Engineer	42	30	—12	3.0	14.0	—11.0	Office man	29	51	22	15.5	2.0	13.5
Engineer	28	16	—12	12.0	21.0	—9.0	Sales manager	45	46	1	3.0	1.0	2.0
Engineer	52	31	—21	2 5	11.5	—9.0	Production manager	60	60	0	1.0	1.0	0
Physician	18	12	—6	17.0	20.0	—3.0	Chemist	17	13	—4	17.5	19.0	—1.5
Physician	30	33	3	13.0	8.0	5.0	Chemist	49	41	—8	1.0	3.0	—2 0
Physician	42	35	—7	5.0	11.5	—6.5	Chemist	21	37	16	18.0	9.5	8.5
Physician	56	48	—8	2.0	5 0	—3.0	Psychologist	51	53	2	4.0	4.0	0
Lawyer	44	32	—12	2.5	10.0	—7.5	Teacher, social science	35	52	17	9.0	1.0	8.0
Lawyer	50	35	—15	1.0	9.5	—8.5	Production manager	24	52	28	15.0	2.0	13.0
Lawyer	53	46	—7	1.0	4.0	—3.0	Journalist-Advertiser	47	48	1	2.0	1.5	0.5
Lawyer	50	48	—2	1.0	1.0	0	Banker	36	40	4	8.5	6.5	2.0
Lawyer	41	36	—5	7.0	7.0	0	Office man	48	40	—8	3.0	5.5	—2.5
Lawyer	47	37	—10	5.0	9.0	—4.0	Office man	49	44	—5	4.0	6.0	—2.0
Chemist	53	50	—3	1.0	2.0	—1.0	Physician	44	53	9	4.0	1.0	3.0
Chemist-Engineer?	38	43	5	3.0	3.0	0	Farmer	57	41	—16	1.0	4.0	—3.0
Chemist?	49	52	3	2 5	2.0	0.5	Engineer	33	54	21	9.5	1.0	8.5
Teacher, social science	44	27	—17	2.5	16.5	—14.0	Bond salesman	31	34	3	13.0	6.0	7.0
Teacher, social science?	31	28	—3	11.5	13.5	—2 0	Lawyer	48	59	11	1.0	1.0	0
Journalist-Advertiser	51	42	—9	3.0	6.0	—3.0	Lawyer	59	64	5	1.0	1.0	0
Farmer?	48	56	8	1.0	3.0	—2.0	Dentist	41	63	22	2.5	1.0	1.5

C.P.A.	37	24	—13	10.0	15.0	—5.0	Teacher, social science. ..	53	64	11	2.0	1.0	1.0
Accountant	53	65	12	1.0	1.0	0	Chemist	35	48	15	8.0	5.0	3.0
Banker	36	27	—9	9.0	11.0	—2.0	Journalist-Advertiser	45	53	8	3.0	1.0	2.0
Average standard score..	42.8	38.6	—4.2					39.7	46.1	6.4			
Median, rank order				2.9	7.3	—4.4					4.3	3.3	1.0
Engineer	52	55	3	1.0	1 0	0	Grocer						
Engineer	40	45	5	3.0	3.0	0	Oil worker						
Engineer	42	46	4	7.0	4.0	3.0	Patent examiner						
Engineer	41	21	—20	3 5	19.0	—15.5	Salesman						
Engineer	50	41	—9	2.0	6.5	—4 5	Salesman						
Engineer	55	59	4	2.0	2 0	0	Salesman						
Engineer	58	52	—6	1.0	1.0	0	Salesman						
Engineer	35	30	—5	9.5	12.5	—3.0	Salesman						
Accountant	53	47	—6	2.0	4.5	—2 5	Salesman						
Lawyer	36	33	—3	4.0	10.0	—6 0	Football coach						
Lawyer	53	59	6	2.0	2.0	0	Business						
Journalist ?	38	42	4	8 0	5.0	3	Investment Analyst						
Journalist ?	47	51	4	3.0	4.0	—1	Secretary Trade Association						
Farmer	34	34	0	6.0	9.0	—3	General Insurance						
Life insurance salesman	65	49	—16	1.0	2 0	—1	Claims department, Insurance Company						
Average standard score.	46.6	44.3	—2.3										
Median, rank order				2.9	5.0	—2.1							

* Occupations which cannot be scored: Geologist changed to welfare director; business man to construction inspector, business man to workmen's compensation director; business or lawyer to professor of economics; business man to analyst of securities; investment broker to assistant buyer; investment broker to credit manager; foreign trade to traffic manager; building and loan to trust department of bank; "Don't Know" to property management ?; "Don't Know" to investment analyst; "Don't Know" to business manager of college; "Don't Know" to professor of political science; business man or engineer (?) to salesman (?); "Don't Know" to salesman; "Don't Know" to sales manager; entomologist to salesman; salesman (?) to contractor (?).

TABLE 113 (*Concluded*)

Occupational Choice in 1927	Standard Score			Median Ranking of Occupational-Interest Score			Occupational Choice in 1937	Standard Score			Median Ranking of Occupational-Interest Score		
	1927	1937	Difference	1927	1937	Difference		1927	1937	Difference	1927	1937	Difference
Foreign trade							Office man	37	26	—11	5.0	15.5	—10.5
Consul ?							Accountant	37	37	0	5.0	7.5	—2.5
Diplomatic service							Lawyer	42	39	—3	2.0	6.0	—4.0
Technical work, movies							Author	30	40	10	14.0	6 0	8.0
Economist							Office manager	34	32	—2	10.5	12.5	—2.5
Business							Sales manager	46	48	2	2.0	4.0	—2.0
Business							Securities salesman	44	40	—4	4.0	5.0	—1.0
Business							Banker ?	39	34	—5	6.5	11.0	—4.5
Business							Advertising manager	36	36	0	4.0	4.5	—0.5
Investments							Salesman	53	44	—9	1.0	4.0	—3.0
Investments							Real estate salesman	48	51	3	1.0	1.0	0
Investments							Sales manager	44	33	—11	1.5	13.0	—11.5
Don't know							Office man	53	39	—14	1.0	3.0	—2.0
Don't know							Office man	39	31	—8	5.0	10.0	—5.0
Don't know							Office man	53	61	8	1.0	1.0	0
Don't know							Office man	56	56	0	1.0	2.5	—1.5
Don't know							C.P.A.	38	45	7	7.5	4.0	3.5
Don't know							Teacher, social science	34	63	29	8.0	1.0	7.0
Average standard score	...	...	...	...	...	...		42.3	41.9	—0.4			
Median, rank order	...	...	...	...	...	...					4.0	4.8	—0.8
Summary													
Average standard score	44.1	40.5	—3.6					40.7	44.5	3.8			
Median, rank order				2.9	5.0	—2.1					4.2	4.1	0.1

follow-up, where it was reported: "Upon the basis of these figures it appears that when a man changes his occupation he will obtain a slightly poorer interest score in the first occupational choice after the change than before (median rankings, respectively, of 2.2 in 1927 and 3.4 in 1932). And similarly apparent is the converse tendency to obtain a slightly better interest score in the second occupational choice after it has been selected than before (median rankings, respectively, of 5.0 in 1927 and 3.0 in 1932)."

Van Dusen[14] reports similar results. Average interest score on occupational choice for 28 freshmen was —2.63 quartile on old scales; this decreased to —3.29 when these men were seniors and had shifted their choice to some other occupation. The average score on occupational choice when seniors on freshmen blanks was —2.79, which increased to —2.43 on the senior blanks. The scores increased for the 35 men in the "No change" group from —2.32 (B rating) to —1.86 (B+ rating). None of the changes are statistically significant, but they indicate a trend toward higher scores being obtained when the occupation is the one the individual has chosen as his lifework than when the occupation is not so chosen. The fact that the "No change" group scores higher than the "Change in choice" group suggests that there is agreement between vocational-interest scores and vocational choices which are permanent at least to the extent of enduring throughout college life.

The slight decrease in interest score in an occupation no longer chosen as one's lifework and the corresponding increase in score in an occupation after being so chosen may be explained on a two-fold basis: First, every new experience enriches one's understanding of terms, and it is only to be expected that some items on the blank will take on new meanings after entering an occupation and so be checked differently. Second, certain other changes in marking the blank can be explained by the tendency to mark them as one ought to rather than in terms of one's real interest. Thus men applying for a job to sell insurance nearly always mark that particular item as liked, although many of them are rated C in the interest of salesmen when all the items on the blank are taken into

[14] A. C. Van Dusen, "Permanence of Vocational Interests" (unpublished Doctoral dissertation, University of Florida Library, 1938), Table III, revised by letter of October 8, 1938.

account. The astonishing thing is that the total interest score is so little affected by such reactions.

When all the cases are considered whose occupational choice in 1927–28 can be scored for, i.e., 140 men, we find that they averaged 45.3 standard score in 1927–28 and 44.8 in 1937 on their original occupational choice (see Table 112). The difference of —0.7 is insignificant, having a critical ratio of only 0.8. The median rankings are, respectively, 2.6 and 3.8, with a difference of —1.2, which has a critical ratio of 2.9.

To give an idea of the real significance of these figures, contrast them with what chance would give. When 40 blanks are marked by a throw of dice and scored for the 23 occupations considered here, the average of the 40 scores on the 23 occupational scales is 28.1. It is evident that the difference between 28.1 obtained by chance and 45.3 obtained actually is too great to have been obtained by chance. Again, if a first blank is arbitrarily assigned to the occupational choice of psychologist, a second to the choice of physician, a third to the choice of dentist, etc., so that 23 blanks are thus assigned to each of the 23 occupations, the averages are 29.5 for 1927 and 31.9 for 1937 instead of 45.3 and 44.8. The averages of the rankings obtained from the 23 blanks where the occupational choices were based on chance are 12.0 and 11.6; these agree almost perfectly with the average of chance rankings ranging from 1 to 23, which is 12. The rankings of 2.6 and 3.8 actually obtained differ greatly from what a chance choice would give.

We must accordingly conclude that there is high agreement between occupational choice in 1927–28 and interest-test scores secured both at that time and ten years later. The same is true, but to not quite the same degree, as regards occupational choice in 1937 and test scores at that time and ten years earlier.

NINE-YEAR FOLLOW-UP OF COLLEGE FRESHMEN

The high relationship between interest scores of college seniors and occupation-engaged-in ten years later might be true and yet conclusions based on it might not apply equally well to younger men. Accordingly data have been assembled regarding college freshmen who were tested in 1930 and retested in 1939. Since,

however, the results of the two separate investigations are quite similar, it has not seemed necessary to publish the detailed data regarding the freshmen. A general summary is given in Table 114,

TABLE 114

OCCUPATIONAL CHOICE AND INTEREST SCORES OF SENIORS CONTRASTED WITH THOSE OF FRESHMEN, BOTH IN COLLEGE AND 9–10 YEARS LATER

Group	Occupational Choice When in College					Occupational Choice 9–10 Years Later				
		Standard Score		Rank Order			Standard Score		Rank Order	
	N	In College	9–10 Years Later	In College	9–10 Years Later	N	In College	9–10 Years Later	In College	9–10 Years Later
No change in occupational choice:										
Seniors	95	46.2	46.9	2.2	2.8					
Freshmen	58	46.3	48.3	3.0	2.5					
Change in occupational choice:										
Seniors	45	44.1	40.5	2.9	5.0	48	40.7	44.5	4.2	4.1
Freshmen	57	41.7	38.1	4.0	8.5	78	40.0	45.6	6.0	3.6

together with corresponding figures from seniors so that comparisons can be conveniently made between the two follow-ups. The scores for those who did not change their occupational choice are essentially alike on their original and retest blanks. Freshmen who changed their occupational choice scored lower in their first choice on the original and retest blanks than did seniors, but both scored essentially alike on both blanks nine years later.

The fact that freshmen interest scores agree slightly less with their early occupational choice than is the case with seniors is what is to be expected. Choice of occupation should be less stable among freshmen. It is evidenced by the fact that a larger percentage of freshmen changed their choice and also by the fact that those choices do not agree as well with interest scores.

It is impossible to tell whether the slightly poorer prediction of interest based on freshmen is caused merely by the less stable occupational choices of freshmen as compared to seniors or by the fact that the freshmen being younger have less well-formulated interests—they were three years younger than the seniors at the time of the first test and four years younger at the time of the retest. Probably both factors have contributed. The surprising thing is that they have affected the results so little.

SUBSTANTIATION OF THE FOUR PROPOSITIONS

Data of 116 seniors from Tables 110 and 112 and of 101 freshmen (not reported here in detail) are combined in Table 115. These are all the cases in the two follow-up studies that provide data for the following three comparisons concerning a given occupation, i.e.,

	1927 Choice	1937 Choice
1.	The given occupation	The given occupation
2.	The given occupation	Some other choice (B)
3.	Some other choice (A)	The given occupation

The table reports the number of cases in each group, which of the three comparisons is involved, and the mean interest score of 1927, or 1930 in the case of the freshmen, for 23 occupations.

1. The first proposition, that men continuing in an occupation for nine to ten years average higher interest scores in that occupation than in any other, holds true for eight of the nine comparisons; the exception involves one man continuing in real estate selling who scored 57 in office work, 54 in sales manager, and 53 in realtor—all three being high scores.[15] If the scores in the occupational choices of each group are averaged, the mean score of 50.2 is obtained. This may be compared with 47.7 as the mean score of the highest occupation other than that chosen by the nine groups, and with 44.3 as the mean score of the next highest occupation.

When rank order of interest scores is considered, and not average scores, it appears that the occupation engaged in ranks second in the case of college seniors (Table 110 or 114) and third in the case of college freshmen (Table 114). To repeat, a college student who continues ten years in the same occupation enters an oc-

[15] The apparent tie in the case of 24 lawyers—a score of 42 in both lawyer and realtor—is not quite a tie since the former is 45.2 and the latter is 44.5.

In one sense the standard scores of 50 and 40 on one scale are equal to 50 and 40 on any other scale. The difficulty experienced in developing group occupational scales (chap. 9) should warn one that standard scores may not be equivalent in all respects. It is fitting in this chapter to assume their equivalence since interpretation of interest scores is made on that basis. The point at issue here is: to what extent do interest scores predict occupation-engaged-in after graduation; and all guidance in this study and elsewhere assumes the equivalence of standard scores.

cupation in which he ranks second to third best on the average, but a group of students engage in the occupation in which they average the highest score.[16]

2. The second proposition, that men continuing in an occupation obtain a higher score in it than men entering another occupation obtain in it, is true in six of the nine comparisons. In the other three comparisons, engineers score 46, one farmer scores 54, and chemists score 50 on engineering interest; lawyers score 45 and journalists 49 on lawyer interest; and realtors tie with the score of 53 with salesman on realtor interest. These are not serious discrepancies, since the interests of engineers correlate .63 with the interests of farmers and .88 with those of chemists; and the interests of lawyers correlate .76 with those of journalists.

3. Men continuing in an occupation obtain higher scores in it than men who change from that occupation to some other. (This involves comparison of the scores of *a* and *b* as given above.) The proposition is upheld in five of the seven possible comparisons—one teacher who abandoned teaching scored 44, whereas the three who continued scored 42; and one salesman who changed to another occupation scored 55, in contrast to the score of 51 for four salesmen who continued. On the average the seven groups who continued had a mean score of 48.0, and those who changed to another occupation had a mean score of 44.0.

4. There are 68 cases in which a man has changed from one occupation to another and both occupations can be scored (30 of these cases are shown in the first section of Table 113). The occupational choice in college of these 68 men had an average standard score of 42.4, whereas the occupational choice nine to ten years later had an average score of 40.5 on the blanks filled out in college.[17] Consequently the fourth proposition, that men changing from occupation A to occupation B score higher in B prior to

[16] See Table 116, p. 418, for further substantiation, in that four groups of professional men average higher on their own occupational interest than on any other, whether tested as students or as adults.

[17] The larger amount of data in the bottom half of Table 114 agree with the data above surprisingly well, in that the original choice in college of 102 men had a mean standard score of 42.8, whereas the occupational choice of 126 men at a later date had a mean standard score of 40.3 on the blank filled out in college. These data include the complete records of the 68 cases reported above and the partial records of all the remainder who could be scored on one occupational choice but not on the other choice.

TABLE 115

MEAN SCORES OF COLLEGE MEN WHO DID AND DID NOT CHANGE THEIR OCCUPATIONS FOR NINE TO TEN YEARS AFTER BEING TESTED IN COLLEGE

A = Occupational choice later abandoned; B = Occupational choice other than that originally adopted.

N	Occupational Choice		Psychologist	Physician	Dentist	Mathematician	Engineer	Chemist	Production Manager	Farmer	Mathematics-Science Teacher	Personnel Manager	Social Science Teacher	Minister
	In 1927	In 1937												
39	Physician	Physician	30	48	41	30	37	41	31	39	35	22	22	18
3	Physician	B	27	36	33	14	21	25	28	29	35	43	38	32
1	A	Physician	36	51	50	38	50	53	40	38	40	11	7	12
43	Engineer	Engineer	20	31	29	26	46	40	43	43	37	37	21	12
28	Engineer	B	22	33	31	26	43	40	43	41	36	31	21	13
1	A	Engineer	38	44	44	37	49	49	33	53	45	20	17	23
12	Chemist	Chemist	34	40	33	35	50	54	41	42	41	30	21	16
5	Chemist	B	30	41	36	33	44	47	35	42	39	24	23	18
5	A	Chemist	23	28	28	22	36	39	36	39	39	33	24	14
1	Farmer	Farmer	13	27	29	20	54	41	53	59	41	28	18	7
0	Farmer	B												
3	A	Farmer	16	33	31	26	42	34	38	41	29	25	18	12

3	Teacher	Teacher	25	25	20	28	33	31	32	29	43	41	39	28
1	Teacher	B	14	18	10	9	12	10	24	27	30	44	44	31
3	A	Teacher	13	25	25	18	27	23	30	33	28	28	32	18
1	Realtor	Realtor	−1	13	15	−9	28	16	49	29	29	52	25	11
0	Realtor	B												
1	A	Realtor	9	13	18	4	18	13	38	29	34	44	45	22
4	Salesman	Salesman	5	16	12	4	14	8	31	28	20	36	33	13
1	Salesman	B	1	11	5	2	−1	−13	15	15	16	43	49	33
6	A	Salesman	7	18	16	9	23	15	32	31	24	33	30	14
24	Lawyer	Lawyer	15	24	18	14	17	16	26	26	23	34	34	21
14	Lawyer	B	21	26	22	23	26	26	28	32	29	31	32	16
3	A	Lawyer	35	39	29	24	21	28	23	28	25	33	34	27
4	Journalist	Journalist	27	34	22	20	21	24	20	26	18	29	30	20
4	Journalist	B	28	27	21	21	25	27	26	30	30	39	36	21
7	A	Journalist	36	38	33	29	37	40	30	36	33	31	28	24

TABLE 115 (*Concluded*)

N	Occupational Choice		C P.A.	Accountant	Office man	Banker	Sales Manager	Realtor	Life Insurance Salesman	Advertiser	Lawyer	Journalist	President
	In 1927	In 1937											
39	Physician	Physician	26	22	27	22	24	33	26	31	36	35	29
3	Physician	B	25	20	32	22	34	38	39	40	39	34	22
1	A	Physician	23	22	24	21	20	32	16	31	24	33	38
43	Engineer	Engineer	24	33	36	25	27	32	21	26	26	27	31
28	Engineer	B	24	30	34	24	28	34	24	29	29	29	33
1	A	Engineer	18	25	33	19	11	23	15	20	24	28	6
12	Chemist	Chemist	26	28	29	20	23	26	17	27	29	32	30
5	Chemist	B	26	28	32	24	25	30	21	27	33	32	27
5	A	Chemist	23	31	38	22	29	35	25	30	26	28	27
1	Farmer	Farmer	19	37	28	27	29	28	15	15	15	17	33
0	Farmer	B											
3	A	Farmer	26	29	34	27	27	32	24	27	29	29	34

3	Teacher	Teacher	30	37	40	27	33	32	31	30	31	27	24
1	Teacher	B	22	28	38	19	46	41	43	42	29	30	27
3	A	Teacher	31	34	41	33	32	43	35	33	32	31	29
1	Realtor	Realtor	26	40	57	35	54	53	49	33	25	19	46
0	Realtor	B											
1	A	Realtor	24	37	52	25	42	40	37	34	28	24	26
4	Salesman	Salesman	22	26	35	36	49	53	51	40	37	29	39
1	Salesman	B	23	25	42	36	51	48	65	44	40	28	39
6	A	Salesman	27	31	39	31	47	46	44	38	31	28	35
24	Lawyer	Lawyer	32	28	35	31	39	45	42	40	45	35	31
14	Lawyer	B	34	32	35	31	34	40	34	37	43	35	27
3	A	Lawyer	33	14	24	21	33	42	38	47	49	44	30
4	Journalist	Journalist	33	19	25	21	30	45	37	52	49	50	33
4	Journalist	B	36	25	36	24	34	39	34	43	44	40	25
7	A	Journalist	28	25	30	18	24	32	26	37	39	38	25

the change than they did in A, falls short of being true by two standard scores.[18]

From the foregoing it is clear that the first proposition is definitely true when group averages are considered, the second is supported in six of nine comparisons, and the third is supported except for the record of two individuals; while the fourth proposition is almost but not quite sustained.[19]

When we take into account the number of cases of men engaged in work which they indicate is not to their liking, and consequently realize that occupation-engaged-in is not a true criterion of the occupation these men should be in, it seems likely that these results are about as good as can be expected.

In discussing occupational dissatisfaction Sarbin and Anderson[20] point out that there are two alternatives regarding the stability of interests each of which leads to a different counseling procedure. According to the first alternative:

A person's interests are temporally stable; they are relatively crystallized *prior* to entry into the occupational world; when the occupational activities and the interests are at variance, dissatisfaction results. The dissatisfaction is a consequent or a resultant of a fixed personality interacting within an occupational milieu.

Their second alternative is:

A person's interests are temporally not stable; they are flexible and subject to change *subsequent* to entry into the occupational world; they may change as a result of lack of success, environmental factors, or more fundamental personality traits in interaction. The dissatisfaction is antecedent to, or coincident with, changes from a primary pattern of interests to no primary pattern of interests in the present occupational group.

[18] There are too few cases to warrant any conclusion from the third comparison relating to men who abandoned occupation A for the occupation given in Table 115.

[19] Dyer summarizes her 10-year follow-up as follows: "At the end of 10 years, ... 83 percent of those following their first choice of occupation for ten years rated A, B+, or B while 17 percent received ratings of B— and C. Of those who followed their second and third choice for 10 years 89 percent were rated A, B+, and B while only 11 percent rated B—. Of those who followed a choice not made at the time of college graduation at the end of 10 years, 4 of the 5, or 80 percent, made ratings of A or B, and 1, or 20 percent, rated C.

"These figures show that individuals who exhibit a high degree of permanence of vocational choice tend to receive A and B ratings on the appropriate scoring key in Strong's Test." D. T. Dyer, *op. cit.*, p. 286.

[20] T. R. Sarbin and H. C. Anderson, *op. cit.*, pp. 33–34.

Depending upon adoption of one or the other of these two points of view there result two different procedures in counseling:

> If interests are fixed by the time an individual is ready to seek employment, and if dissatisfaction will result if the client enters an occupation outside his interest type, then the clinician will advise him to seek employment in certain restricted areas. If, on the other hand, measured interests and satisfactions are the product of successful achievement, then the clinician will advise clients to seek employment where the greatest possibilities for success are to be found in terms of the clients' abilities and also employment opportunities.

We agree with Sarbin and Anderson that further research is needed to establish how interests arise, their exact relationship to inherited abilities and environmental conditions, and their stability. We feel, however, that if one or the other of these two alternatives is to be adopted it should be the first with its resulting counseling procedure, since it is more in harmony with the facts here reported, i.e., that interests arise early in life, are remarkably stable, and for the most part are surprisingly little influenced by occupational training and experience. But we must insist that the dichotomy is unnecessary; true counseling must consider both interests and abilities.

Chapter 17. Interpretation of Interest Profiles

Since little or nothing is known concerning a client when he comes to a counselor for vocational guidance it is best to think of him as located at the center of a sphere where the average man is located. The outstanding men in all walks of life may be thought of as distributed over the surface of the sphere. For lack of any better concept of how occupations are distributed over the surface of such a sphere, we use the interest globe—see Figures 7 and 8, page 152. The direction the client should go from the center toward the surface is dependent upon his interests; the distance he will go is dependent upon his abilities and drive or motivation. Without ability he can't travel far; without motivation he won't exert himself sufficiently to go far.

Direction and distance are not separate considerations, but it is easy to think of the former as a matter of interests and of the latter in terms of ability and drive. The two are related at least to the extent that a man, lacking the necessary abilities, would be foolish to go where fancy leads, and, on the other hand, lacking interest, would find it tragic to proceed from a sense of duty alone where ability indicates. It is the counselor's job to size up the client and help him direct his energies into the lifework which he will most enjoy and which he will be best able to carry on.

Abilities and interests must be considered simultaneously or alternately, first one and then the other. There is no great value in considering abilities which one's interests do not require and vice versa. Practically, a counselor cannot consider both at the same time, and so is forced to determine one set of factors first. Usually the most valuable factor to determine first is the man's present and potential socio-economic level or—expressed in less debatable terms—his general intelligence and OL scores. If these scores are high, any occupation may be considered, but primarily

those in the upper levels; if such scores are low, only occupations at the lower levels seem appropriate.

There are hundreds of occupations, thousands of jobs. It is ridiculous to suppose that a particular individual can be successful and happy in just one of them. Practically speaking, it is impossible to conceive of a guidance system that could function so well that men could be assigned to one only of all the occupations there are. Consequently, early guidance must formulate a general program in which some group of occupations is made the objective for each youth. As the youth advances toward this objective he should acquire more and more information from study and experience concerning the various occupations within the general area of his objective. Eventually he should be able to make an intelligent choice of a restricted objective—small enough for him to succeed at, large enough to give him scope for his varied abilities and interests.

Three guidance techniques.—Three procedures are utilized in determining whether or not a man is fitted for a position. The first of these, mentioned in most treatises on guidance and selection, involves three steps: (1) determination of the job requirements; (2) determination of the man's qualifications; and (3) estimation whether or not the man's qualifications fit the job requirements. The increasing use of job analysis is extending our understanding of the elements of many jobs. But much remains to be done before guidance is as efficient as may be. One of the obstacles to real progress is the fact that two rather different sets of components are used in analyzing jobs and men. Consequently after both man and job have been sized up it is still quite a problem to determine whether or not they fit.[1]

The second guidance technique makes use of a battery of tests so weighted through the use of multiple correlation as to give the highest possible correlation with the criterion. Here the candidate

[1] An excellent discussion of this subject is to be found in W. H. Stead, C. L. Shartle, *et al., Occupational Counseling Techniques* (American Book Company, 1940).

For a discussion of the profile concept, see in addition the following: M. R. Trabue, "Occupational Ability Patterns," *Personnel Journal* (1933), 2, 344–51; A. F. Dodge, *Occupational Ability Patterns* (Bureau of Publications, Teachers College, 1935, No. 658); and B. J. Dvorak, *Differential Occupational Ability Patterns* (Bulletin of the Employment Stabilization Research Institute, University of Minnesota Press, 1935, Vol. 3, No. 8).

receives one score resulting from combining his partial scores on several subtests. He is accepted or rejected, depending upon whether his score falls above or below the passing mark. When the tests in the battery are measures of a fairly homogeneous group of traits the procedure is distinctly useful; but when the components of the battery measure a variety of different traits the procedure has the serious weakness of "averaging" all the tested elements, thereby making it possible for a candidate to pass who has far more than is necessary of one trait and far less than is necessary of another trait.

The third guidance technique reports the scores on every test or rating in the form of a *profile*. The ideal procedure is to express the scores on all tests and ratings in the form of standard scores, or percentiles, so that each measurement may be directly compared with all the remainder. Norms for a profile are obtained by testing men who are acceptably performing the work in the occupation and plotting the means of such scores in profile form. The profile of the candidate may then be compared with the standard profiles of various occupations to see with which occupation his profile best agrees.

Interest profiles for several occupations are given below. Such occupational norms are not needed for the *Vocational Interest Blank* as they are for other types of tests, since the interest-scoring system performs automatically the three steps involved in the first guidance technique, namely, (1) measuring the occupation, (2) measuring the individual, and (3) estimating how nearly the interests of both fit or agree.[2] (Seemingly the same technique should be developed for scoring ability tests.)

When the third guidance procedure is employed it is often quite unnecessary to score the candidate on all the tests. As soon as he fails on an important test it is obvious that he cannot qualify, and no further testing is necessary, since he has failed to jump a hurdle and all must be cleared to be acceptable. There are, of course, occasions when a failure on one test does not necessarily flunk him. This would be true if such a failure merely meant that he would not perform one part of an occupation satisfactorily but

[2] The meaning of an interest score is considered at length in chapter 5.

could be employed at other jobs within that occupation. Then again, if the test which has been failed measured fitness in an acquired activity, the candidate might be employed providing he could receive special training in this deficiency.

The profile represents a clinical approach to guidance and employment. A great variety of characteristics can be considered, not only test scores but items from the application blank, from rating sheets, and from interviewing. The strong and weak characteristics stand out when plotted on a profile, enabling one to appreciate what they are singly and also in the total combination. The procedure makes it possible to add or subtract characteristics in the light of continuing experience.[3]

USE OF A SINGLE OCCUPATIONAL-INTEREST SCORE

Before considering the use of a profile of many interest scores, let us note how just one score should be interpreted.

Suppose, for example, a man wants to enter engineering (or any other occupation) and is scored on that one scale to confirm his desire. The significance of his score can be expressed in terms of the percentage of men successfully employed in the occupation who obtain a score no higher than the candidate does. The theoretical and actual distributions of such cases are given on page 64. Using data based on actual distribution, we have the actual percentage of members of the occupation who obtain such scores as tabulated below.

Rating	Score	Percentage*
A	45 and up	70.2
B+	40 to 44	11.9
B	35 to 39	9.6
B—	30 to 34	4.8
	Below 30	3.5

* As these data are based on the criterion groups, the percentages of A and B+ ratings are probably higher than would be obtained from a new sample. See the third section of chapter 24.

An A rating represents a good chance of having the interests of the occupation for even the lowest score in this range; i.e., 45 is

[3] A suggestive discussion of the procedure is to be found in R. S. Schultze, "Standardized Tests and Statistical Procedures in Selection of Life Insurance Sales Personnel," *Journal of Applied Psychology* (1936), **20**, 553–66.

above that obtained by 30 per cent of men in the occupation. Twelve per cent of successful men obtain a rating of B+, leaving 18 per cent who score below 40. The student who really wants to enter engineering with a B+ rating should be encouraged to go ahead, for he has a reasonable chance of belonging in the group; but the student who is not so sure should face the fact that possibly some other career will fit him better. As the score falls below 40, the chances of having the interests of engineers become rapidly fewer and encouragement should decline correspondingly.

In the case of several occupational scales, B ratings and even B+ ratings fall within the shaded area on the report blank. Such scores approximate zero raw score and should be viewed with suspicion. See page 88, above, for further consideration.

Scores below the shaded area indicate that the individual definitely does not have the interests of the occupation. This negative information is frequently of real value, as previously pointed out (p. 89).

A good rule to follow here is: occupations rated A and B+ should be carefully considered before deciding against them; occupations with lower ratings extending down into the shaded area on the report blank should be carefully considered before deciding to enter them; occupations with scores falling below the shaded area should not be considered.

Consider another example on the employment side. What scores are acceptable for employment on the life insurance scale? Extensive data are given in Table 129 (p. 499) as to the subsequent success and failure of men employed by the Aetna Casualty and Surety Company. The records show percentages of success as follows:

Rating	Percentage of Outstanding Success	Percentage of Success	Percentage of Failure
A	25	53	22
B+	16	56	28
B	11	47	42
C	4	20	76

On this basis there is one chance in four of failure if the man has an A or B+ rating and nearly one chance in two of failure with a B rating. The writer's own data (Table 124, p. 492) indicate that A men are more likely to earn a reasonable income than B+ men.

An employment manager must consider the chances of success and failure of a candidate, since it costs money to hire men who do not make good. Taking such into account, we should say that an applicant with an A rating represents a good chance, an applicant with a B+ rating represents a somewhat poorer chance and should not be hired unless other considerations are favorable, and an applicant with a rating below B+ should not be hired except for especially good reasons. (Remember that one out of four with C rating made good in the Aetna Company; the applicant may be such a man. At the same time, remember that such a man may have higher ratings in other occupations.)

The great objection to the use of a single occupational-interest score is that no information is available as to what the man's interests are respecting other occupations. There is always a chance he has a higher score on another occupation. In addition, as pointed out below, different combinations of occupational-interest scores lead to different conclusions as to which occupations will prove most acceptable.

PROFILE OF OCCUPATIONAL INTERESTS

Reports on occupational interests are given to students in the form of a profile (see Fig. 27, p. 421). Such profiles, as we have seen, are quite stable (Table 105, p. 372).

The mean scores of students in medicine, dentistry, engineering, law, and business on 35 scales are given in Table 116; profiles of these mean scores are depicted in Figures 27 to 31. The table also gives the mean scores of adult men, from our criterion groups, in the first four of these occupations. It is evident that the profiles of students and adults in the same occupation are quite similar. Correlations showing these relationships are given in Table 117. In Table 118 are given (*a*) the correlations between the profiles of the four adult groups and (*b*) the correlations between the scores on corresponding occupational scales. Each procedure differentiates occupations quite satisfactorily.

The average profile of 47 medical students (Fig. 27) shows that these students have a primary interest in Occupational Group I (A rating in physician and B+ in dentist, with B— ratings in artist and architect); and tertiary interests in Group II, farmer,

TABLE 116

MEAN SCORES OF FIVE GROUPS OF STUDENTS UPON 35 SCALES, AND SIMILAR SCORES FOR ADULT MEN ENGAGED IN MEDICINE, DENTISTRY, ENGINEERING, AND LAW

Group	Occupational Scale	Physician		Dentist		Engineer		Lawyer		Business
		47 Students[a]	Adults	145 Students[a]	Adults	121 Students[a]	Adults	60 Students[a]	Adults	214 Students[b]
I	Artist	32	32	29	29	24	25	23	26	17
	Psychologist	29	26	23	18	20	21	18	20	14
	Architect	33	33	31	32	30	33	21	26	18
	Physician	46	50	42	42	33	34	25	32	20
	Dentist	41	42	47	50	31	29	18	23	16
II	Mathematician	28	29	24	23	27	30	18	23	16
	Engineer	35	37	33	33	46	50	22	26	25
	Chemist	38	36	35	30	41	40	19	23	23
III	Production manager	31	32	33	32	43	44	29	28	35
IV	Farmer	37	35	40	38	43	36	26	26	31
	Carpenter	19	20	28	26	33	26	5	6	16
	Printer	33	28	39	33	39	28	25	23	31
	Mathematics-science teacher	34	31	39	32	37	30	23	23	30
	Policeman	29	28	35	30	33	27	23	22	27
	Forest service	24	25	29	25	31	29	12	15	20
V	Y.M.C.A. physical director	29	26	35	25	24	18	25	21	25
	Personnel manager	24	23	24	20	27	30	36	32	36
	Y.M.C.A. secretary	18	19	22	19	14	15	25	23	25
	Social science teacher	24	21	29	23	19	14	34	28	34
	City school superintendent	21	23	22	20	12	18	28	31	23
	Minister	21	22	23	18	11	12	22	21	17
VI	Musician	34	26	37	30	28	18	25	21	24
VII	C.P.A.	26	23	21	21	24	28	35	36	32
VIII	Accountant	22	29	24	24	31	30	29	26	39
	Office worker	28	24	32	30	34	28	35	28	42
	Purchasing agent	26	24	29	30	36	34	32	28	39
	Banker	23	24	27	29	24	24	31	31	34

[a] These data are shown in profile form in Figures 27–30.
[b] Subdivisions of this group are shown in profile form in Figures 31–34.

TABLE 116 (*Concluded*)

Group	Occupational Scale	Physician		Dentist		Engineer		Lawyer		Business
		47 Students[a]	Adults	145 Students[a]	Adults	121 Students[a]	Adults	60 Students[a]	Adults	214 Students[b]
IX	Sales manager	25	24	26	26	27	29	38	32	38
	Real estate salesman	33	32	34	35	34	30	43	39	40
	Life insurance salesman	28	28	29	29	22	22	40	36	34
X	Advertising man	32	30	28	29	27	28	39	37	34
	Lawyer	36	36	30	31	27	29	47	50	32
	Author-journalist	36	35	30	31	28	30	35	37	28
XI	President	30	32	28	32	32	39	32	34	34
OL		57	61	53	58	54	61	61	64	54
MF		47	46	49	47	57	54	44	43	50
Mean age		20.0	40.9	22.5	42.4	20.7	43.9	22.7	39.2	22.7

[a] These data are shown in profile form in Figures 27–30

[b] Subdivisions of this group are shown in profile form in Figures 31–34.

TABLE 117

RANK-ORDER CORRELATIONS BETWEEN PROFILES OF FOUR GROUPS OF STUDENTS WITH SIMILAR PROFILES OF ADULT MEN ENGAGED IN MEDICINE, DENTISTRY, ENGINEERING, AND LAW

(N = Scores on 34 Scales)

Groups	Adult Physician	Adult Dentist	Adult Engineer	Adult Lawyer
47 Physician Students	.91	.78	.49	.29
145 Dentist Students	.70	.89	.34	—.09
121 Engineer Students	.50	.63	.87	—.06
60 Law Students	.00	—.02	.00	.91
214 Business Students	—.17	.03	.20	.58

TABLE 118

CORRELATION BETWEEN PROFILES OF FOUR OCCUPATIONS (UPPER RIGHT-HAND PORTION OF TABLE) AND CORRELATIONS BETWEEN SCORES OF COLLEGE SENIORS ON THE CORRESPONDING OCCUPATIONAL-INTEREST SCALES (LOWER LEFT-HAND PORTION OF TABLE)

Groups	Adult Physician	Adult Dentist	Adult Engineer	Adult Lawyer
Adult physician	...	.81	.57	.29
Adult dentist	.87	...	.51	.13
Adult engineer	.52	.58	...	.18
Adult lawyer	.16	—.18	—.44	...

and Group X. The average profile for 145 dentist students (Fig. 28) is similar to that of medical students in that it has a primary interest in Group I, but here the A rating is in dentist and the B+ rating in medicine. The dental student has secondary interest in Group IV (B+ rating in farmer, B ratings in printer, mathematics-science teacher, and policeman) and tertiary interests in chemist, physical director, and musician. The dental student has more of the interests of Group IV than either engineering or medical students. This seems appropriate, since his work calls for manual, mechanical work—in Europe his profession is classified among the skilled trades.

The average profile of 121 engineering students who subsequently entered engineering is shown in Figure 29. The engineering student has a primary interest in Group II (A rating in engineer, B+ rating in chemist), with secondary interests in production manager and Group IV (B+ rating in farmer and B rating in mathematics-science teacher) and a tertiary interest in purchasing agent.

The profile of law students (Fig. 30) is very different from that of engineering students. The primary interest of law students is in Group X with an A rating in lawyer and B ratings in advertising and journalism; a secondary interest is in Group IX, with two B+ and one B ratings. In addition there are B ratings in personnel manager, C.P.A., and office worker.

The preceding profiles all exhibit concentration of interest in the appropriate occupation. The average profile for business students is quite otherwise (Fig. 31), including no primary interest. Two secondary interests are to be found in Groups VIII and IX; in addition there are B ratings in production manager and personnel manager.

Students headed for a profession have in the main rather clear-cut interests in that direction (a >shaped profile). It is no wonder that they find themselves rather early and from there on have no misgivings about their choice of a field, even if they do worry at times as to just in what phase of that field they shall specialize. Students headed for business, on the other hand, are as a group quite heterogeneous. For the most part their interests are less definite but at the same time more widely distributed (a flat pro-

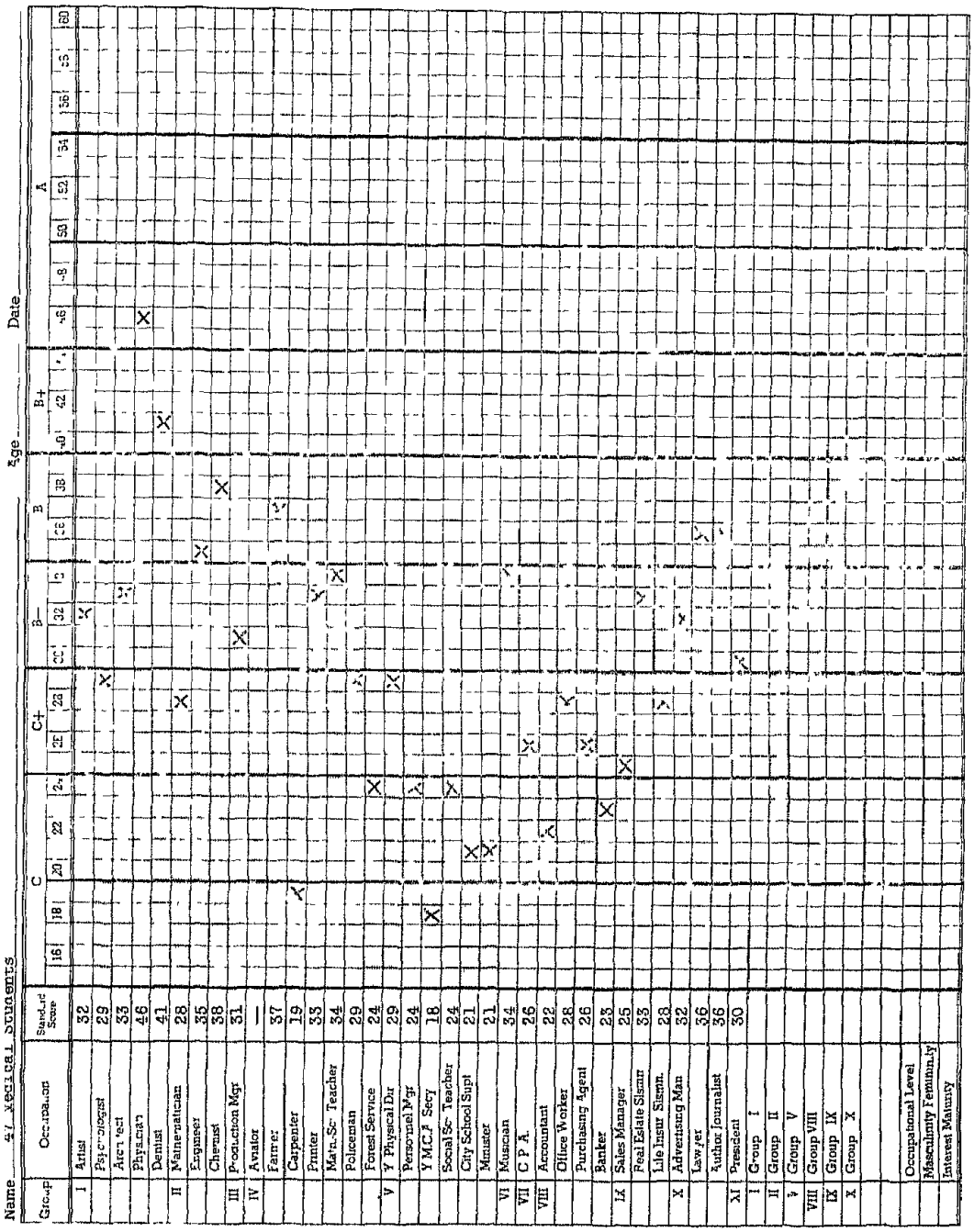


FIG. 27.—Scores of 47 medical students

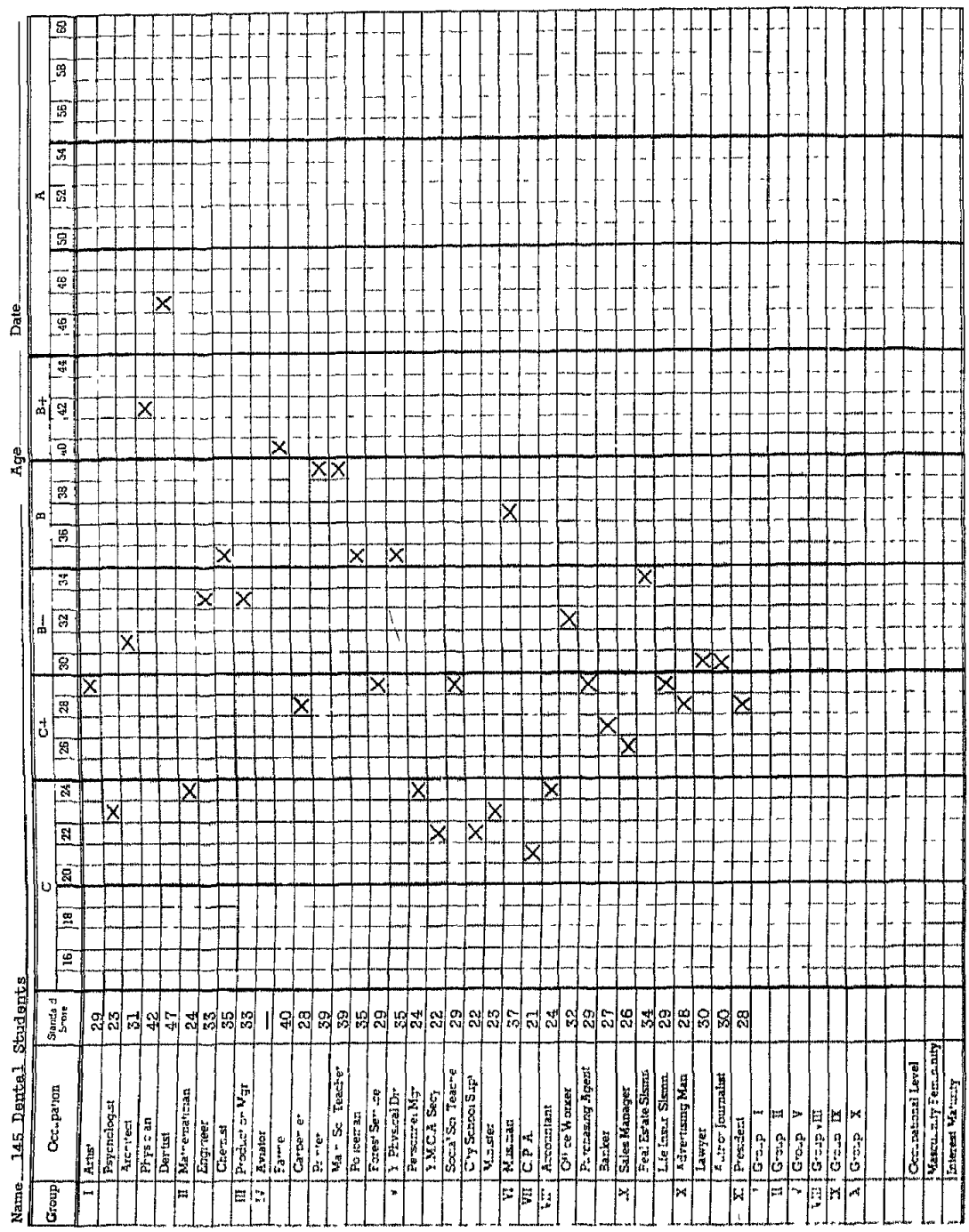


FIG. 28.—Scores of 145 dental students

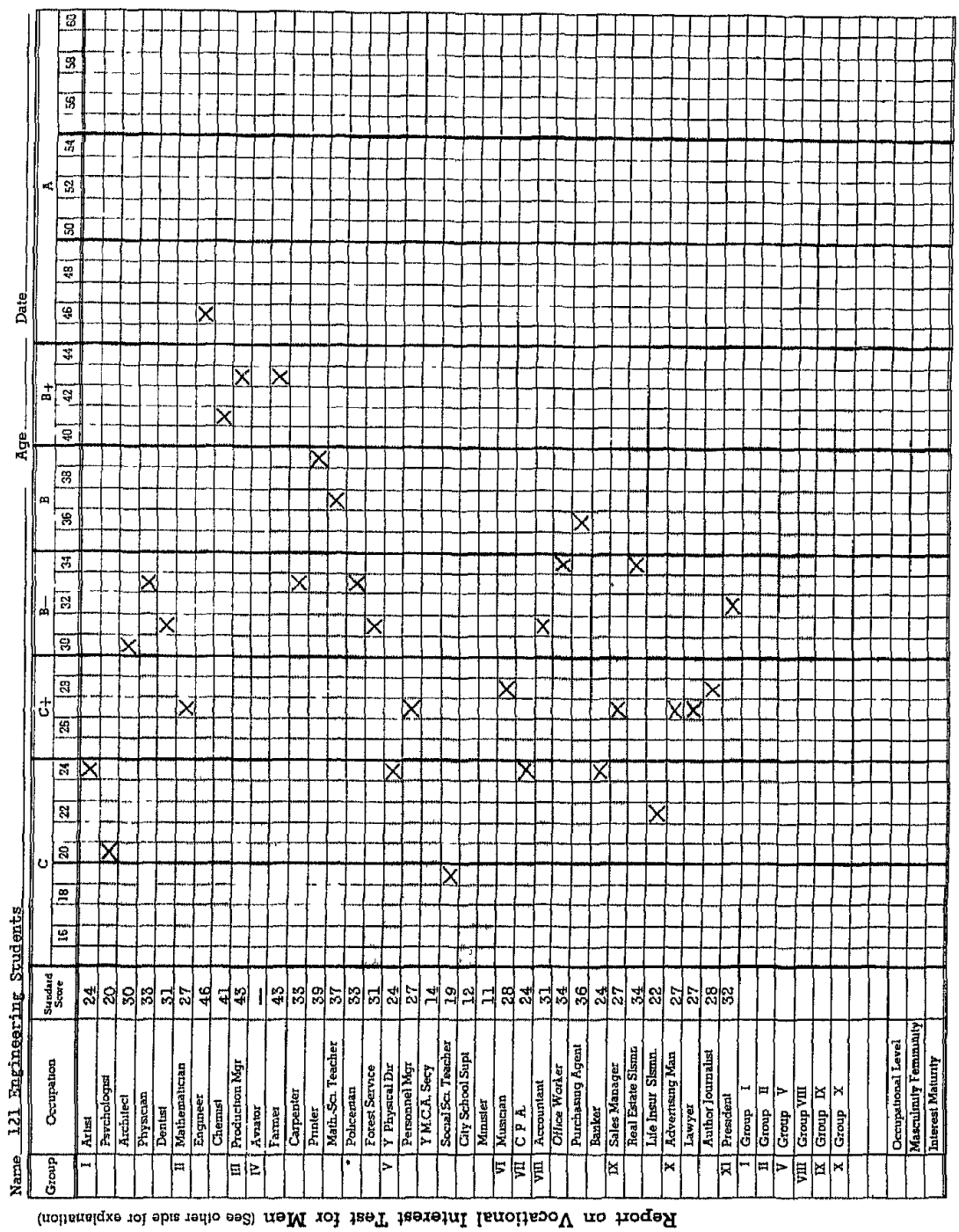


FIG. 29.—Scores of 121 engineering students

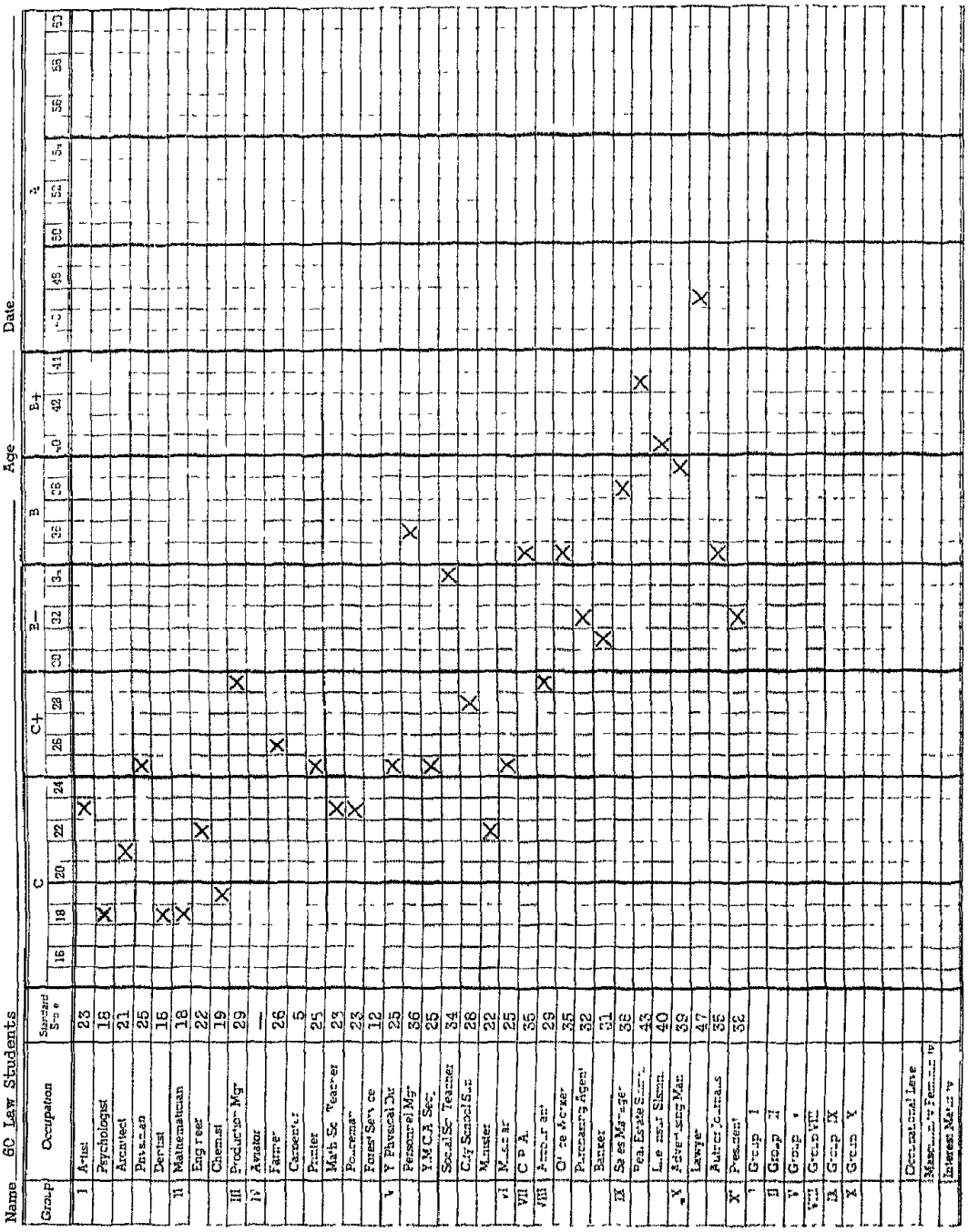


FIG. 30.—Scores of 60 law students

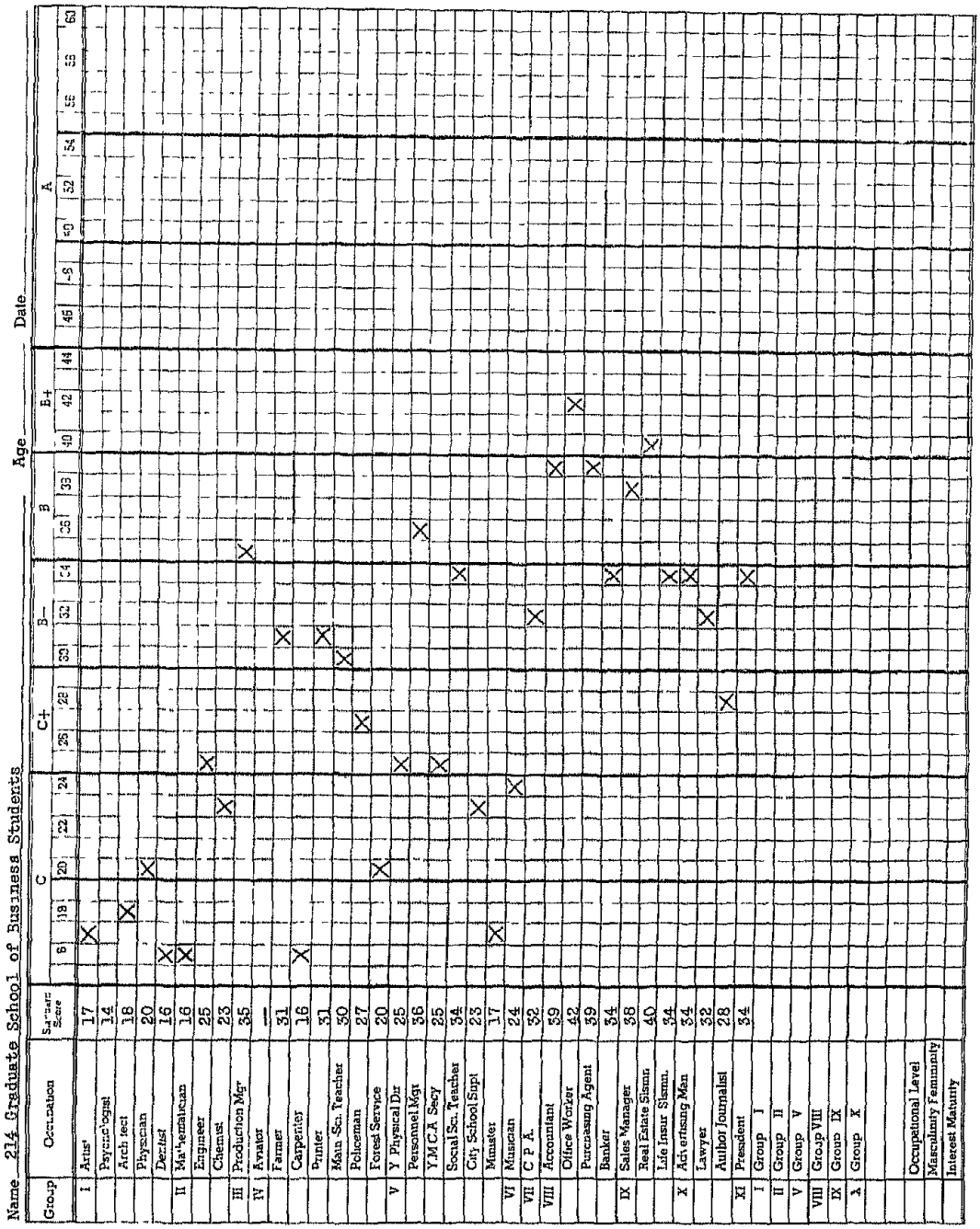


FIG 31.—Scores of 214 Graduate School of Business students

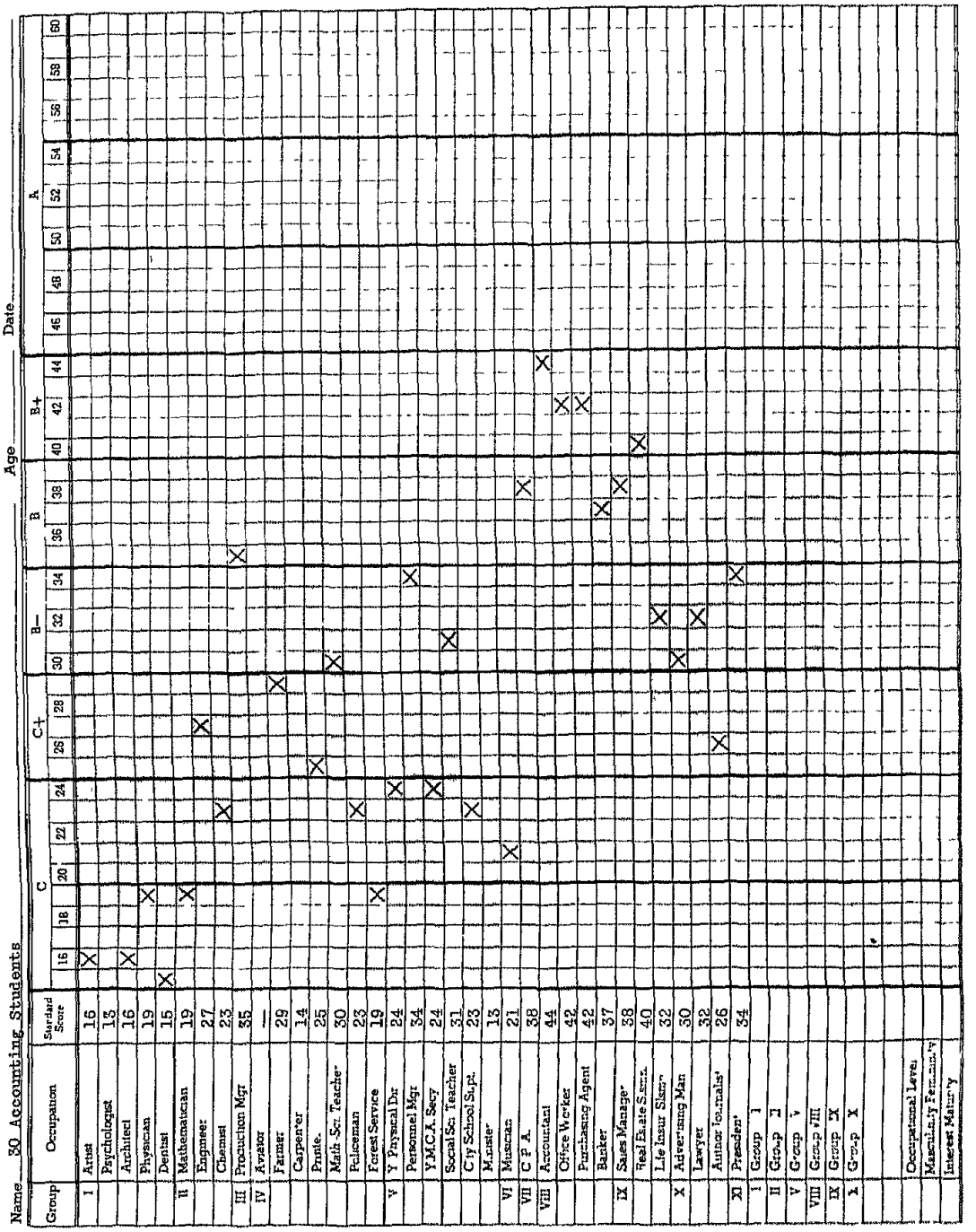


FIG. 32.—Scores of 30 accounting students

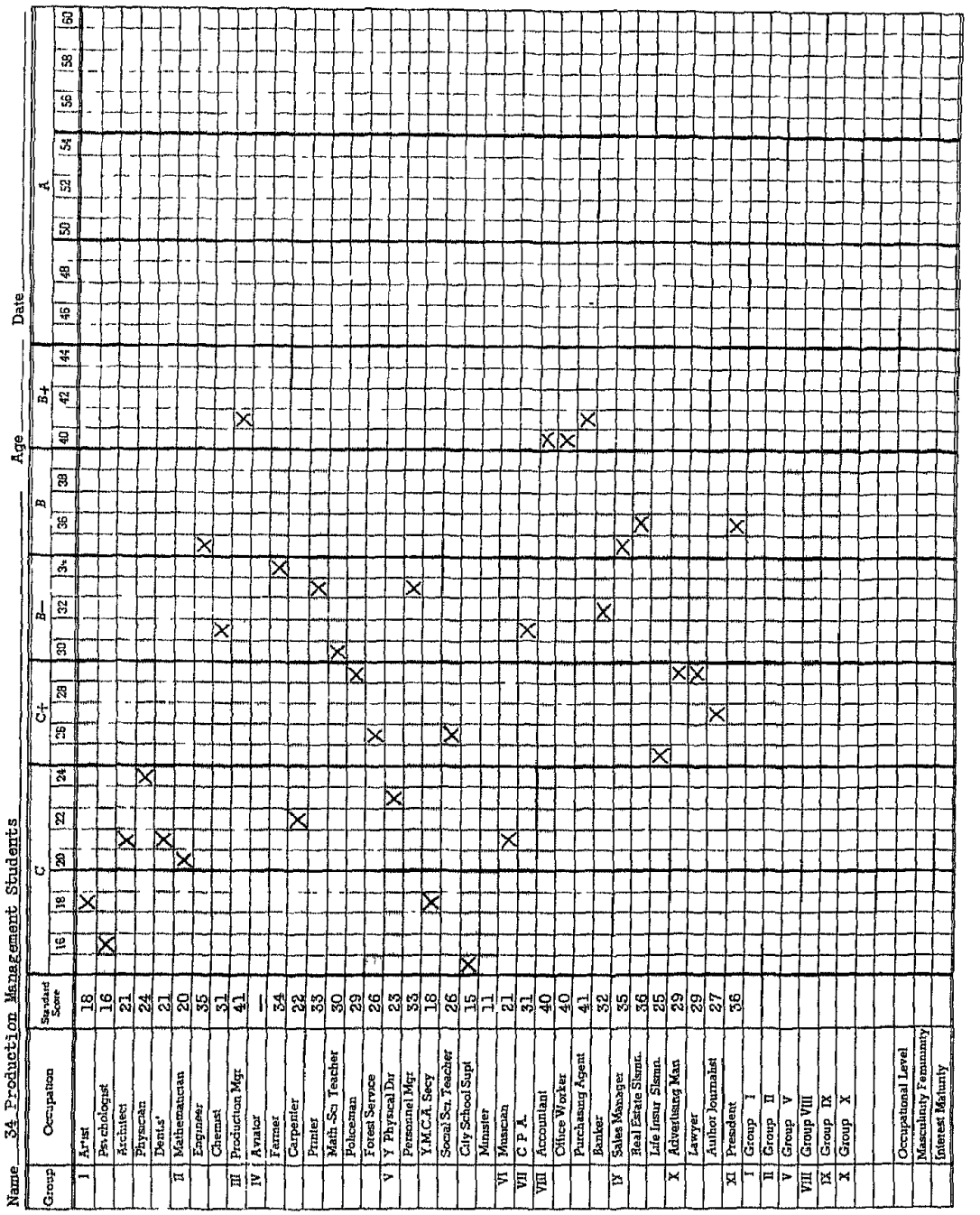


FIG. 33.—Scores of 34 production-management students

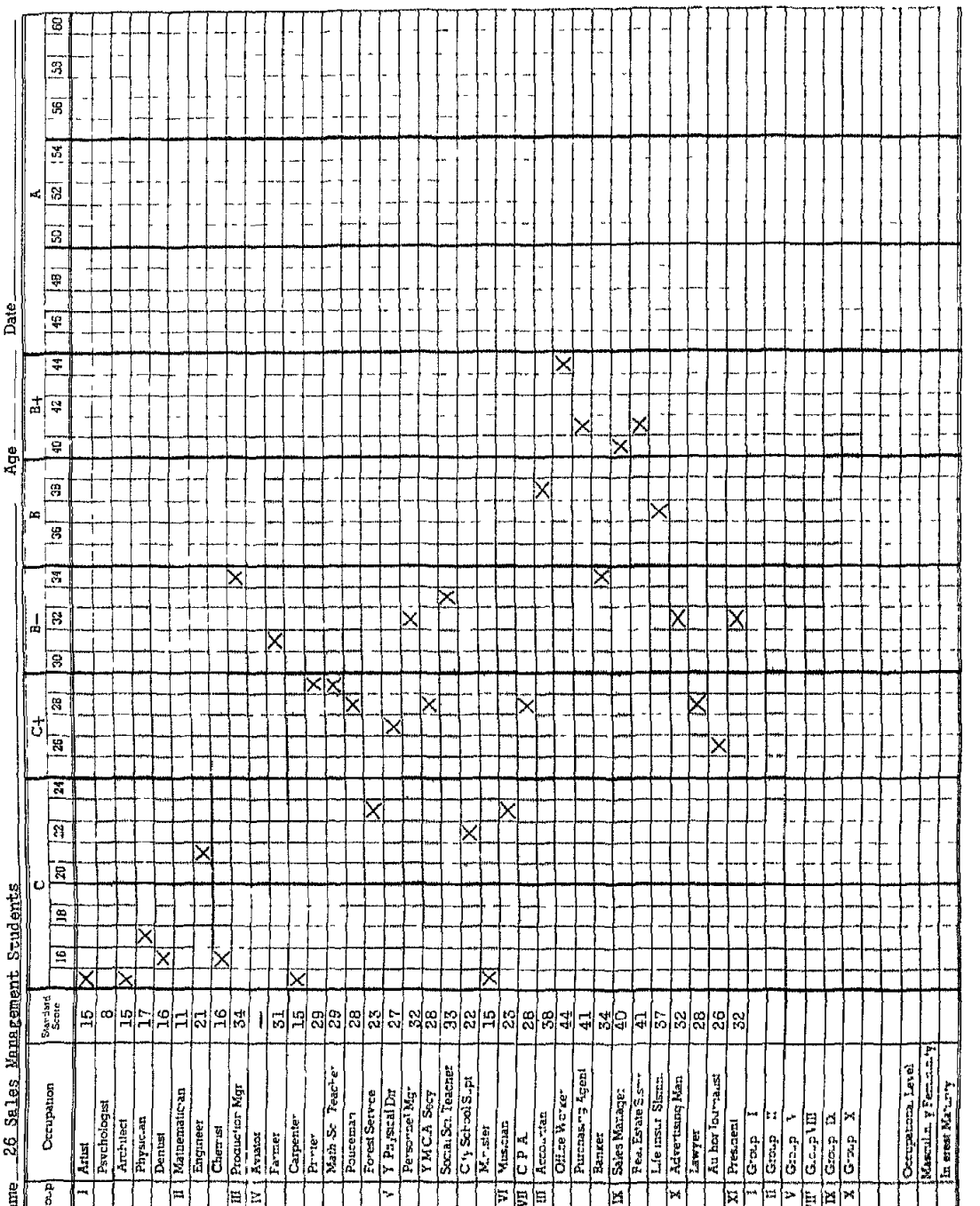


FIG. 34.—Scores of 26 sales-management students

file) than those of the professional student. It is not surprising that they have greater difficulty in finding themselves.[4] Conversations with them lead the writer to the hypothesis that for the most part they enter business after realizing that their interests are not in the professions.

It must be realized that business is a very broad term as far as interests are concerned. Well-recognized business activities are represented in our occupational groups of III, V, and VII–XI, and there are business men whose interests fall in Groups I, II, IV, and possibly VI. Hence any type of interest may be accompanied by what is recognized as business. Consequently, business is an impossible term to use as far as guidance based on interests is concerned. Business must be subdivided, and guidance must be conducted in terms of accounting, selling, advertising, etc., or possibly in terms of a better list of activities included within business which will be discovered as we know more about the subject.

Of the 214 business students included in Figure 31 it has been possible to assign 178 with a fair degree of accuracy to a single phase of business or to management in general. The latter term is the best possible one to cover the activities of presidents and general managers. Its use with recent graduates is rather questionable, even though some have their own businesses or hold such positions largely because of family backing. Three subgroups contain as many as twenty-six men, and the profiles of these three are given in Figures 32–34. The accounting group (Fig. 32) has a definite profile, with a primary interest in Group VIII, a secondary interest in Group IX, and tertiary interests in production manager, personnel manager, and C.P.A. Business students entering production (some having had undergraduate work in engineering and chemistry) have two secondary interests—one in production manager, the other in Group VIII (Fig. 33). Their tertiary interests are engineer, president, and Group IX. The sales group, not including retail selling, has secondary interests in Groups VIII and IX and tertiary interests in production and per-

[4] The Syracuse study reports a larger number (34 per cent) of students in the business school undecided about their vocation than in any other school. These were undergraduates, whereas the data presented above pertain to students in a two-year graduate school of business. See D. Katz and F. H. Allport, *Students' Attitudes* (Craftsman Press, 1930), p. 104.

sonnel manager (Fig. 34). The two profiles of production and selling are not as distinct as might be expected. A fourth subgroup may be mentioned, that of general management. It has a secondary interest in Group VIII and tertiary interests in production and personnel manager, president, and Group IX. It will be noted that the most striking fact about all these four subgroups is that Occupational Group VIII is a primary interest in the accounting group and a secondary interest in the other three and that it averages the highest interest in all four.

Students with widespread interests and often (but not necessarily) without A ratings should consider business, particularly if they have a secondary interest in Group VIII and score a B or better in most of the following: sales manager, realtor, personnel manager, and production manager. Which functions they should specialize in, if any, must be determined by the relative strengths of the various ratings.

Mean scores of seven additional occupations are supplied in Table 119. Based upon good samples of successful adults, they afford a better basis for depicting the profiles of these occupations than data from students.

The interest scores of 36 salesmen selling office equipment for a national concern, subdivided into two groups of 24 and 12 as the blanks were received by us for scoring, follow.

Occupational Group	Occupation	Mean Scores of 24 Salesmen	Mean Scores of 12 Salesmen
IX	Sales manager	47	47
IX	Realtor	46	45
IX	Life insurance	44	45
VIII	Office work	44	44
VIII	Purchasing agent	41	41
VIII	Accountant	34	36
V	Personnel manager	39	36
V	Social science teacher	37	34
III	Production manager	37	35
X	Advertiser	35	34
XI	President	35	37

It is evident that the two subgroups agree surprisingly well. The primary interest is in Group IX, with a secondary interest in Group VIII; that is, the primary interest is in selling, which is their job, and the secondary interest is in office activities, which is the prime interest of the people to whom they sell.

TABLE 119

MEAN SCORES OF SEVEN OCCUPATIONS ON 36 INTEREST SCALES*

(N = 100 from each criterion group)

Group	Scale	Artist	Production Manager	Personnel Manager	Accountant	Sales Manager	Author-Journalist	President
I	Artist	50.3	18.3	18.0	15.1	17.0	41.7	21.5
	Psychologist	32.7	12.6	17.3	9.9	4.3	30.4	10.7
	Architect	49.8	22.5	21.3	18.2	18.2	36.7	24.7
	Physician	46.4	26.0	22 6	19.9	18.0	39.7	24.5
	Dentist	41.7	23.5	17.4	17.6	16.9	28.1	22.3
II	Mathematician	31.5	20.1	18.5	18.0	12.1	29.2	17.9
	Engineer	32.3	37.2	30.9	28.1	26.8	27.7	32.9
	Chemist	34.2	29.5	24.7	20.9	17.5	27.7	23.3
III	Production manager	23.5	49.9	41.5	39.2	39.4	22.8	40.3
IV	Farmer	34.3	33.2	27.3	28.2	27.1	24.3	28.9
	Carpenter	23.0	23.6	15.0	17.9	13.1	6.8	16.7
	Printer	35.4	28.8	26.1	27.9	21.5	27.7	22.6
	Mathematics-science teacher	23.6	30.1	29.4	30.1	22.3	16.9	23.4
	Policeman	20.4	30.4	27.3	28.7	24.5	16.8	22.7
	Forest service	22.0	27.3	24.3	21.6	18.7	12.7	18.8
V	Y.M.C.A. physical director	19.4	22.8	27.6	25.0	21.0	15.5	17.7
	Personnel manager	19.6	33.7	49.8	34.6	31.7	24.7	27.6
	Y.M.C.A. secretary	16.8	21.5	30.4	26.0	23.7	17.0	20.0
	Social science teacher	19.6	22.9	30.7	29.2	22.9	21.7	19.6
	City school superintendent	17.7	22.9	32.7	25.6	20.4	24.5	19.1
	Minister	24.8	14.4	22.1	16.3	12.0	22.6	13.0
VI	Musician	43.3	16.7	19.0	20.8	13.4	31.3	14.4
VII	C.P.A.	22.6	25.4	30.5	39.3	24.5	31.1	26.5
VIII	Accountant	11.3	35.1	35.8	50.3	32.6	15.2	30.4
	Office worker	18.0	34.9	36.2	46.9	36.6	19.4	33.4
	Purchasing agent	17.1	39.9	36.0	41.9	42.6	19.8	38.0
	Banker	19.5	31.6	29.6	39.0	33.1	23.3	31.4
IX	Sales manager	22.2	34.7	36.8	35.5	49.8	29.6	39.2
	Real estate salesman	33.9	33.6	34.7	35.6	43.1	37.2	37.9
	Life insurance salesman	27.1	27.8	32.6	31.7	40.0	32.5	33.0
X	Advertising man	41.9	28.0	33.1	29.1	36.0	47.3	33.3
	Lawyer	37.0	27.8	32.8	29.3	29.2	46.5	29.8
	Author-journalist	45.8	26.8	28.7	26.0	27.3	49.9	29.4
XI	President	33.2	39.9	35.4	34.4	44.0	36.9	49.6
Occupational level		58.5	59.9	61.3	59.6	63.0	63.7	63.4
Masculinity-Femininity		37.4	52.2	47.9	46.1	48.3	36.6	47.8

* Data on Dentist, Engineer, Lawyer, and Physician in Table 117.

PRIMARY, SECONDARY, AND TERTIARY INTERESTS

The greater ease of interpreting occupational scores when they are plotted in a profile instead of being listed in a column is sufficient justification for using the present *Report Blank*. The seeming ease of interpreting a profile, however, leads too often to hasty decisions. In order to make sure that the profile is carefully analyzed the writer has found it desirable to express the scores under the three headings of primary, secondary, and tertiary interests.

At the beginning, all A ratings are called *primary* interests, all B+ ratings are called *secondary*, and all B ratings *tertiary*. But unless each such interest is supported by fairly high ratings in related occupations the interest is reduced to a lower classification. Thus, a B+ rating in printer, unsupported by any B or higher ratings in Group IV, is viewed with suspicion and we put a question mark after it.

What are *supporting occupations?* A preliminary definition is that they are occupations belonging to the same occupational group. All such occupations, by definition, correlate .60 or more with the given occupation. This definition serves us well in many cases. But there are cases where a better interpretation is secured by using a different definition of supporting occupation.

What we are trying to do is to locate the student upon the surface of our interest sphere (see Figs. 7 and 8, p. 152). To illustrate what we have in mind let us use the mean scores of artists and personnel managers as given in Table 119 instead of the records of two students. The A ratings of artists are in journalist, artist, architect, and physician. These four interests are included within the heavy inner circle of the left-hand half of Figure 35. The B+ ratings of artists are in dentist, musician, and advertiser. They are included within the second circle. The B ratings are in printer and lawyer and these are included in the third and outer circle. The three circles depict far more accurately the scope of the interests of artists than the single highest score which is in artist interest.

The right-hand half of Figure 35 gives similarly the location of the interests of personnel managers in business. Their primary interest is personnel, with a B+ rating in production manager.

But they have tertiary interests in office work, sales, and president. The three circles indicate the personnel manager is a business man and not a social worker for none of his primary, secondary, and tertiary interests are in Occupational Group V, except that of personnel manager.

Suppose we have two men with high ratings in Group X (a primary interest); one has a secondary rating in Group IX, the other in artist of Group I. When we look at the figures we see that the two men are to be located near Group X, but one is on the side toward Group IX and the other toward Group I. The second man, with his linguistic and artistic interests, might very well consider advertising from the creative side, whereas the first man should consider advertising from the more practical aspect of selling or sales promotion. The first man should also consider law, as can also the second man, but with the artist B+ rating we should put advertising on the creative side ahead of law for him. Journalism is also a possibility in both cases. Consider another example, where two men rate A in engineer and B+ in chemist. The first also rates B+ or B in physicist, or mathematician, or dentist, or physician, while the second rates B+ or B in farmer or carpenter or both. It would seem that both men are located near engineer, the first man on the side toward Group I, the second man toward Group IV. The former would seemingly be more interested in pure science, the design aspect of engineering, while the second man would be interested in the mechanical, manipulative activities of production engineering.

Such interpretations should be viewed not as facts but only as hypotheses to set before the client, so that as the days go by he may mull them over and discover how much they appeal to him. The writer finds it very advantageous to show a student, on Figures 7 and 8, just where his interests lie and then with him deduce what sort of activities are likely to be performed by occupations situated in that area.

A *supporting occupation*, then, is any occupation that is located near the primary occupation and aids in determining the general area of a man's interests on our interest globe. Artist is such a supporting occupation for Group X; but the remaining occupations in Group I are too far removed from Group X to be

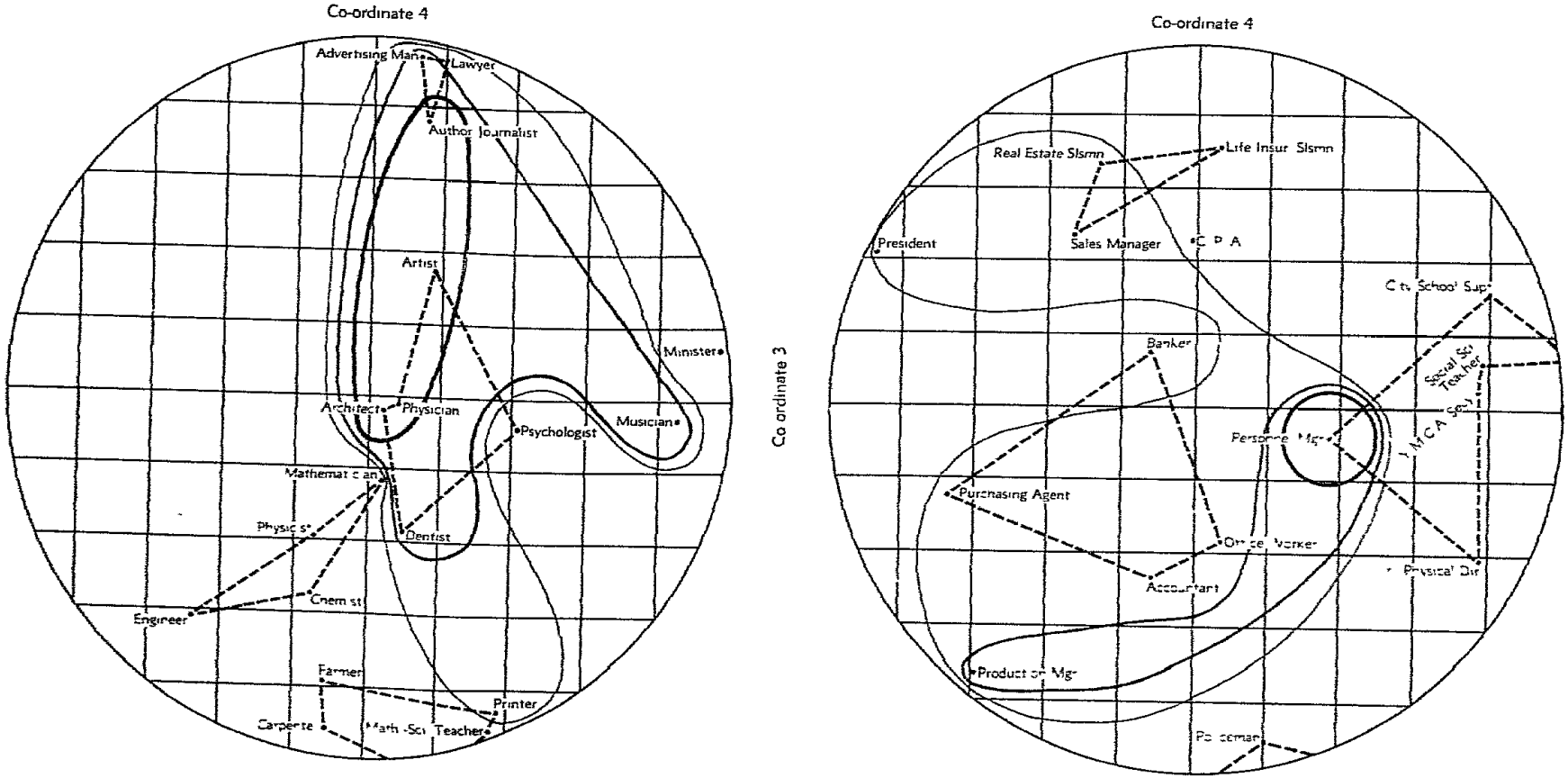


FIG. 35.—The left-hand diagram gives the location of the primary, secondary, and tertiary interests of artists; the right-hand diagram similarly gives the location of the interests of personnel managers.

useful in this connection.[5] If there are significant scores in both Groups I and X we may conclude that the man's interests are spread quite wide over the upper surface of Figure 7 or possibly that he has two foci of interests in these two areas.

In endeavoring to picture the center, or centers, of a man's interests, it is often valuable to note the low C ratings as well as the B+ and A ratings, since the former indicate as definitely where the man isn't as high ratings indicate where he is. C+ and B— ratings are neutral, and with the revised scales can very well be ignored. Low C ratings are especially valuable when confronted by a student whose parents have used undue pressure upon him to enter some occupation for which the student now suspects he is not fitted. If the student scores B or B+ in such an occupation it is pointed out that the parents' advice is based on something real in his make-up But when he rates a low C the evidence is clear that the parent is wrong, so far as interests go.

Since there is a tendency for men to score somewhat higher in an occupation they are planning to enter than in other occupations, judging from scores they obtain at a later date when they have shifted to another occupational choice,[6] it is wise to discount somewhat the score in their chosen field. So, if a student scored 48 in both advertising and law and if he at that time was planning to enter advertising, law should be emphasized, since he has scored as high in it as in advertising, despite his present intentions. If, on the other hand, law was his choice, advertising should be emphasized, since he has not considered it and it is quite possible that if he changed his mind and planned to enter it he would then score higher in advertising than in law. Similarly significant scores on occupations to which he reacts negatively should be forcibly called to his attention. He probably will not accept them at that time but may discover himself warming up to them as time goes on.

A somewhat different method of interpreting occupational scores is to use primary, secondary, and tertiary classifications as outlined above but to express such interests as "linguistic"

[5] Psychologist, architect, and physician correlate .50 to .52 with journalist and lend some support to journalist but not to lawyer and advertiser.

[6] See p. 401.

(Group X), "uplift" (Group V), "scientific" (Groups I and II), and the like. The writer admits he uses such terms himself; it seems difficult to escape doing so. But he has less confidence in such names given to occupational groups than he has in the occupational names themselves. For example, when such names are used, Group IX is always referred to as "sales." But several types of salesmen do not score particularly high on the three scales in Group IX. The interests of salesmen of a public utility correlate .69 with office worker, .60 with personnel manager, and .52, .39, and .31 with sales manager, life insurance salesman, and realtor, respectively. Salesmen of engineering goods do not belong in this group nor do house-to-house canvassers of one concern. The same situation may also apply to the use of "linguistic," "uplift," and the like. All such terms are interpretations of our data and as such need to be substantiated by extensive research before being accepted. It is of course much easier to say one has linguistic interests than to recite the three occupations in Group X; but at the present time the data do not warrant more than locating the man on our interest globe and letting him see just what are the facts we have for that diagnosis and what are our interpretations of the facts. After several experiences in which students arrived at a better interpretation of the facts than the writer did, he is loath to mix facts and interpretation without labeling each.

Reliance on many high scores, not merely on one.—Consideration of primary, secondary, and tertiary interests represents a different approach to analyzing vocational interests from that of merely accepting the occupation with the highest score. A high score in personnel manager appears occasionally with few or no ratings of B or higher in Group V and with few or no significant scores in occupations suggesting business. Just what this lone score signifies when found in such conditions the writer has not yet discovered. Considering the relatively few openings in personnel work and the fact that men so engaged are in business and must usually succeed in business activities before becoming personnel managers, it is unwise to encourage a student with such a score to plan on entering personnel work, despite the fact that he scores highest on that occupational scale. If, on the other hand, he had supporting interests in Group V, then that group represents

his interests but probably not personnel work in business—it might point to vocational guidance in an educational system. If, again, the supporting interests were production and sales manager, accountant, and life insurance selling, the interpretation is, first, business in general and, maybe second, personnel work. Such a combination may also mean production, or sales, or office manager in which the personnel interest is a valuable component.

Public administrators more often obtain a score of 35 or higher in personnel manager interest than in any other occupational interest. Of 22 varieties of public administrators we have studied, 19 averaged 35 to 47 in personnel manager interest. Only forest supervisors, public health officials, and chemists-physicists scored below 35. Each type had certain combinations of additional occupational interests and could be differentiated from another only on the basis of the total combinations of primary, secondary, and tertiary interests. Such differentiation may be illustrated by personnel men in industry and in public administration who have the following combinations of interests.

	In Industry	In Public Administration
Primary interests	Personnel manager	Personnel manager
Secondary interests	Production manager	
Tertiary interests	Office worker	Production manager
	Accountant	Social science teacher
	Purchasing agent	City school superintendent
	President	Lawyer
	Sales manager	

The tertiary interests of these two types of personnel work differ appreciably, even though their primary interests are the same.

Suppose, again, a man's highest rating is 43 in production manager. If that score is supported by occupations typical of business, the conclusion is business with possibly specialization on the production side. If the score of 43 is supported, on the other hand, by B+ in engineer or chemist, and by several B scores in Group I, the diagnosis may be engineer, or chemist, as well as production manager, with the preference for engineer, or chemist, since they are better backed up than production manager. If, finally, the 43 score in production manager is supported by Groups II and IV, we may feel much safer in concluding that production manager is correct, and may feel still safer if there are a few B scores in the typical business activities.

In far too many cases reliance is placed upon one occupational-interest score when all scores should be taken into account. Vocational guidance should be based upon a survey of the individual's abilities and interests. It is a great mistake to assume that because the client says he is interested in only one occupation that is the only one upon which he needs to be tested. Too often the client is mistaken; and too often, when he is not, the combination of all his interest scores gives a new and richer interpretation of his situation than the client or counselor could secure without a complete survey.[7]

Secondary interests.—Sufficient attention is not usually given to the secondary interests disclosed in the profile, particularly when there are also primary interests present. Thus a profile with a B+ rating in sales manager and an A rating in both realtor and life insurance salesman is interpreted as selling real estate or insurance. This seems appropriate if these three ratings are the only significant ones in the profile. But, if there is also a B or B+ in personnel and office worker or accountant, we have the background for a good sales manager and selling may be entered with the idea of developing into a managership instead of remaining in personal production.

Mr. E. W. Field, an educational adviser of the C.C.C., reports that educational directors in that service rate high in Group V; in consequence, superior and inferior directors cannot be differentiated on that basis. He has enough cases, however, to suggest that the superior directors have significant ratings also in Group IV, whereas the inferior directors do not. Liking to be a carpenter, printer, farmer, etc., enables the educator to get along with foreman and skilled workmen in the camps and also to be genuinely interested in all phases of training for such occupations.[8]

One company reports that there is appreciable separation of both superior and inferior sales managers on that scale from non-

[7] See p. 690 as to what happens when students are rigidly assigned to the occupation on which they score the highest.

[8] The superior men scored higher than the inferior men in Y.M.C.A. physical director and personnel manager and the reverse in city school superintendent and minister. They scored ten standard scores higher in policeman and forest service. "It seems, therefore, that our best men have definite interests close to those whose occupations deal with people in rather out of the ordinary ways and not as an orthodox pedagogue."

sales managers. In addition they have found that nearly all of the men who obtain either an A or a C rating on either the Occupational-Group V or the personnel-manager scale have proved to be failures. If further data substantiates this observation based on over fifty cases, we will have two hurdles for prospective sales managers of that company—a high rating on the sales manager scale, and a B, not an A or C, rating on Group V scale.

Another unusual use of secondary interests was reported by Mr. Clarence Peterson when with the Phoenix Mutual Life Insurance Company. He found that a life insurance salesman is more likely to sell insurance to men in those occupations in which the salesman has some interest. Thus if the secondary interest of the salesman is that of a musician he is encouraged to specialize in selling to musicians. Having interests in common with musicians, he finds it particularly easy to hobnob with musicians; if he has none of the interests of a lawyer or a banker, he finds himself ill at ease in their presence.

Broad vs. narrow interests.—The average profile of professional men indicates, as we have seen, a concentration of interests in a rather restricted area. The interests of business men, on the other hand, are widespread and on the average not so strongly held. These two types may be referred to as narrow and broad interests. Both types may have high ratings or only B+ or B ratings; the element of strength of interest will be discussed in the next section.

A profile with a number of high scores in different groups may be interpreted to mean the possession of broad interests or of two or more primary interests in different directions. A synthesis of different primary interests should be affected wherever possible. First of all, the student should become aware of his several interests, secondary as well as primary. He should be reminded that he ought to have a lot of fun in life working in all those varied fields. Can he find some life work that will involve them all? Thus a student with B+ ratings in forest service, personnel, social science teacher, advertising, lawyer, and journalist synthesized many of these interests when he decided upon public relations work for the park service. In this case the usual career in forest service was discounted, since there were no significant ratings in

Groups II, III, and particularly IV, and there were secondary ratings in Groups X and V.

It is usually necessary to select one occupation when the several interests require long preparation and have little in common, as, for example, engineering, medicine, law, and the ministry. Students often find this difficult to do. When they have high intelligence the writer suggests they continue specialization in the two, or even the three, they are interested in until they discover which one they prefer. One student very much interested in medicine, whose father insisted he prepare for law, completed both the pre-medical and the pre-legal work for the Bachelor's degree, with Phi Beta Kappa standing. As he could not possibly prosecute graduate work in both fields, his counselor had him fill out the *Vocational Interest Blank*, with the result that he scored 60 in physician and 53 in lawyer interest. The high score in lawyer interest satisfied the father's contention that he could make a good lawyer; the still higher score in physician interest reconciled the father to the boy's eagerness to continue in medicine. Most men cannot carry a double program for long. An analysis of their abilities as they relate to the conflicting interests is quite important. But even here the writer favors wherever possible that they take at least one good course in each of their major interests so as to enable them to make the decision their own on the basis of some experience.

A third possibility is to select one interest for the vocation and a second interest for the avocation. Interests of artist, musician, author, and so on, when not predominant, are often best reserved for an avocation.

Strong vs. weak interests.—Primary interests may be considered strong interests, secondary interests are intermediate, and tertiary interests are weak. There are individuals with no, or almost no, ratings above B—. If a blank is filled out more or less at random, a number of B— and B ratings are to be expected—see Table 8, p. 88, which gives the inter-sigma range of chance scores. Consequently a blank with very few or no B ratings approximates chance distribution and is indicative of no positive interests related to occupations.

In one C.C.C. camp over thirty blanks of this sort were noted.

Records of high-school and even college students are found of this type. It is possible that such men may have interests in occupations for which there is no scale today. We hope this is the case. The writer feels that such men do not possess the interests of occupations in the upper socio-economic levels. He suspects that when scales of skilled and semiskilled trades are available many of these cases will be found to belong in such occupations. A low score on the occupational-level scale tends to confirm such an explanation.

When the ratings are B— and below, it is sometimes possible to determine some worth-while facts pertaining to the man's interests by noting the significantly low C ratings. In one case scores in Group I averaged 16; in Group II, 17; and in Group IV, 20. Knowing this is of some help in counseling, we may eliminate these occupations from consideration.

Darley has presented certain data regarding men with no primary interests which indicate that the scholastic records of such men are lower than those with primary interests when the two groups are matched for ability, the differences being great enough "to indicate some underachievement in both high school and college."[9] The writer has a hunch that the general level of the half-dozen highest ratings is a rough measure of the amount of motivation that the individual has at his disposal for working hard and making a success. Men with low ratings have given the impression of being "drifters." This topic needs careful investigation.

Men with low interest scores are very likely to report "don't know" when asked regarding their future careers. This "don't know" is very different from that given by students possessing two or more unrelated occupational interests. The latter have something to talk about, they ask specific questions; and time and ingenuity usually resolve the conflicting interests. The former "don't know" because they have no great urge to go anywhere, occupationally speaking. These are the hardest of all people to counsel, because they have so little to contribute and either they have a lot of half-baked plans that change from interview to interview or they sit back and expect the counselor to prescribe the remedy.

[9] J. G. Darley, *Clinical Aspects and Interpretation of the Strong Vocational Interest Blank* (Psychological Corporation, 1941), p. 53.

ANALYSIS OF SIX CASES

The occupational scores for both 1927 and 1937 of six college seniors who reported in 1937 they were practicing law are given in Table 120. Seniors numbered 3, 21, 43, and 46 have interest

TABLE 120

OCCUPATIONAL SCORES IN 1927 AND 1937 OF SIX COLLEGE SENIORS WHO ENTERED LAW

Occupation	No. 3		No. 21		No. 22		No. 37		No. 43		No. 46	
	'27	'37	'27	'37	'27	'37	'27	'37	'27	'37	'27	'37
Artist	33	29	25	36	40	25	29	31	23	21	23	17
Psychologist	29	21	14	44	12	25	24	38	22	11	26	15
Architect	29	25	22	35	40	42	24	35	16	15	15	7
Physician	28	22	24	36	40	34	35	42	28	27	18	16
Dentist	18	12	24	33	32	42	42	48	19	16	5	5
Mathematician	25	13	7	18	29	30	19	25	22	16	15	7
Engineer	11	11	23	25	36	45	22	30	31	17	9	2
Chemist	15	9	23	35	30	42	29	35	24	13	14	—1
Production manager	11	21	36	23	26	33	21	31	37	24	20	20
Farmer	17	14	22	24	39	42	37	34	28	23	16	16
Carpenter	—5	—14	2	4	20	27	10	11	9	—3	—15	—19
Printer	26	21	31	43	19	27	35	33	23	17	28	17
Mathematics-science teacher	20	12	16	29	14	38	38	45	26	22	19	22
Policeman	11	8	23	21	19	22	24	26	31	25	23	19
Forest service	8	2	8	18	19	31	20	25	30	16	9	2
Y.M.C.A. physical director	16	18	22	37	10	23	33	42	33	26	29	32
Personnel manager	27	33	43	43	15	28	26	38	46	39	52	41
Y.M.C.A. secretary	22	25	21	31	5	19	27	35	34	24	28	38
Social science teacher	35	39	26	39	9	27	28	40	40	38	44	56
City school superintendent	36	35	14	30	5	22	23	37	43	43	38	53
Minister	22	21	16	37	5	23	27	37	33	24	21	36
Musician	32	25	22	35	20	21	45	39	25	22	25	24
C.P.A.	32	35	36	47	25	24	13	22	32	38	49	46
Accountant	17	26	35	21	11	31	16	21	27	17	35	27
Office worker	24	26	42	27	18	29	32	26	26	29	32	34
Purchasing agent	20	32	37	20	26	32	20	18	27	27	28	22
Banker	31	34	23	17	27	29	21	20	27	39	29	31
Sales manager	34	39	40	28	29	20	32	22	39	44	42	39
Real estate salesman	46	50	44	36	39	24	40	28	35	45	44	52
Life insurance salesman	42	45	42	32	29	18	36	31	38	44	45	50
Advertising man	55	54	42	44	36	25	33	37	36	42	56	44
Lawyer	55	57	48	52	38	28	37	43	48	57	59	64
Author-journalist	49	44	34	41	42	25	32	35	35	37	46	40
President	32	39	36	29	45	35	21	23	39	32	23	25
r 1927–1937	.90		.36		.41		.69		.85		.91	
Intelligence[a]	78		67		83		80		61		82	
Grade Point Ratio[b]	2.82		2.18		2.59		2.80		2.26		2.26	

[a] *Thorndike Intelligence Examination for High School Graduates.*

[b] Grade of C = 2, B = 3, etc.

scores suggesting the career of lawyer; seniors numbered 22 and 37, on the basis of interest scores, should not be lawyers. Let us use these six cases to illustrate our procedure in analyzing an occupational-interest profile.

1. The occupational interests of No. 3 in 1927 may be classified as follows:

	A Rating	B+ Rating	B Rating
Primary	Lawyer, advertiser, journalist		
Primary	Realtor	Life insurance	Sales manager*
Tertiary			Social science teacher
			School superintendent

And in 1937:

	A Rating	B+ Rating	B Rating
Primary	Lawyer, advertiser	Journalist	
Primary	Realtor, life insurance		Sales manager
Tertiary			Social science teacher
			School superintendent
Tertiary			President

* Almost but not quite a B rating.

In both test and retest, interests in Group X are superior to Group IX; hence the emphasis is upon Group X, but the student should consider Group IX also, for a realtor with legal training might be his choice. As all three occupations in Group X rate A, the variations in score should not be unduly stressed. The student must make his choice. The writer has found few students with A ratings in all three of these occupations who did not have a fairly definite preference. But the counselor should force the student, nevertheless, to consider all three, to look for other occupations of a similar nature, and to consider combinations of the three. Although these two profiles correlate .90, there are some shifts in occupational scores, but none that affect the diagnosis.

2. The interests of No. 21 in 1927 are:

	A Rating	B+ Rating	B Rating
Primary	Lawyer	Advertiser	Journalist*
Secondary		Realtor, insurance, sales manager	
Secondary		Office	Purchasing, accounting
Secondary		Personnel (?)†	
Tertiary			Production manager
Tertiary			C.P.A.

And in 1937 his interests are:

	A Rating	B+ Rating	B Rating
Primary	Lawyer	Advertiser, journalist	
Primary	C.P.A.		
Secondary		Psychologist	Artist, physician, architect
Secondary		Personnel	Social science teacher, physical director, minister
Secondary		Printer (?)	

* Almost but not quite a B rating.

† The (?) calls attention to the fact that there are no supporting occupations; hence, a questionable secondary interest.

The lawyer interest is clearly first in both tests, that interest being well sustained by interest in advertising and journalism. In 1937 the C.P.A. interest is a primary interest and should be considered as well as lawyer; but there are no secondary or tertiary interests associated with business. Actually all occupations, except lawyer, correlate considerably below .60 with C.P.A., so that none of them can really be classified as supporting C.P.A. Under the circumstances we view C.P.A. as supporting lawyer and not the reverse, and that there are not two competing primary interests here. Since there is great need today for men trained in law and public accounting, the fact should be called to the attention of anyone with both of these interests. This case is an example of low correlation between two profiles, i.e., .35, but the diagnosis of lawyer remains unchanged.

3. The interests of No. 22 exhibit a distinct reversal in the ten-year period. The classification in 1927 is:

	A Rating	B+ Rating	B Rating
Primary	President (?)		
Secondary		Artist, architect, physician	
Secondary		Journalist	Advertiser, lawyer
Tertiary			Engineer
Tertiary			Farmer
Tertiary			Realtor

And in 1937:

	A Rating	B+ Rating	B Rating
Primary	Engineer	Chemist	
Secondary		Farmer	Mathematics-science teacher
		Architect, dentist	Physician*
Tertiary			President

* Almost but not quite a B rating.

The primary interest of president in 1927 is unsupported by any phase of managerial activity or by interest in Group VIII, which seems to accompany business interests. It should be viewed with suspicion. Even then it is difficult to know what to do with it, since a man does not become president until after years of experience; hence we do not help a student particularly by saying, "You should become a president of a manufacturing concern, but we don't know along which line you should advance." Number 22's best interest in 1927 seemed to lie in Group I, supported somewhat by interest in engineer and farmer. The next-best interest is in journalism, supported by advertising and lawyer. Actually this senior entered law and was still practicing in 1937.

In 1937 his interests were definitely in engineering, supported by four B+ ratings and two B ratings in Groups I, II, and IV. President has now dropped to B rating and lawyer to C+ rating. Here is a case of distinct change in interests—correlation between profiles is .41. Neither profile supports his occupational choice and there is little evidence in 1927 to support the distinct interest in engineer in 1937. He reports on three occasions he chose law of his own accord. The fact that he entered his father's law firm upon graduation may have been a factor. Another fact of interest

in this case is that his grade-point ratio for scientific courses was 3.3, compared with 2.3 for English and pre-legal courses.

4. The interests of No. 37 are:

	A Rating	B+ Rating	B Rating
Primary	Musician		
Secondary		Dentist	Physician
Secondary		Realtor	Life insurance salesman
Tertiary			Mathematics-science teacher, farmer, printer
Tertiary			Lawyer

And in 1937:

	A Rating	B+ Rating	B Rating
Primary	Dentist	Physician	Psychologist, architect
Primary	Mathematics-science teacher (?)		
Secondary		Physical director, social science teacher	Personnel, Y.M.-C.A. secretary, school superintendent, minister
Secondary		Lawyer	Advertiser, journalist
Tertiary			Musician
Tertiary			Chemist

Unless a man has unusual talents in music we counsel him to look upon music as an avocation not a vocation. Leaving this primary interest aside, we have two secondary interests of about equal significance, although dentist may be preferred to realtor, since the tertiary interests in Group IV all correlate .40 or higher with dentist. In 1937 dentist is clearly first choice, supported by three interests from Group I and by the A rating of mathematics-science teacher. There are in addition two strong secondary interests in Groups V and X. Here it would seem that this senior had the interests of a dentist, not a lawyer, which he has become. Interest in his chosen field has increased, however, from B to B+. Number 37 reported in 1927 and 1932 that he chose law of his own accord but in 1937 that it was thrust upon him.

5. The interests of No. 43 in 1927 are:

	A Rating	B+ Rating	B Rating
Primary	Personnel	Social science teacher, school superintendent	Y.M.C.A. secretary*
Primary	Lawyer		Advertiser, journalist
Tertiary			Production manager
Tertiary			Sales manager, realtor, insurance
Tertiary			President

* Almost but not quite a B rating.

And in 1937:

	A Rating	B+ Rating	B Rating
Primary	Lawyer	Advertiser	Journalist
Primary	Realtor	Sales manager, insurance	
Secondary		School superintendent	Personnel, social science teacher
Tertiary			C.P.A.
Tertiary			Banker

In 1927 we have two primary interests, of which Group V is seemingly stronger than Group X. In 1937 interest in Group V has waned somewhat and Group IX has replaced it as a primary interest, tied with that of Group X. Now there is little support for selecting personnel manager as first choice. Lawyer is rated highest on both occasions, which is in harmony with No. 43's choice of an occupation.

6. Finally, the interests of No. 46 in 1927 are:

	A Rating	B+ Rating	B Rating
Primary	Lawyer, advertiser, journalist		
Primary	Life insurance salesman	Realtor, sales manager	
Primary	Personnel	Social science teacher	School superintendent
Primary	C.P.A.		Accountant

And in 1937:

	A Rating	B+ Rating	B Rating
Primary	Lawyer	Advertiser, journalist	
Primary	Social science teacher, school superintendent	Personnel	Y.M.C.A. secretary, minister
Primary	Realtor, life insurance salesman		Sales manager
Primary	C.P.A.		

In both tests lawyer scores are very high, 59 and 64, respectively, and these scores are backed up by high ratings in advertiser and journalist. It would seem to be the logical choice, as it has proved to be. The record is that of a high-class man with many high ratings in several fields, with technically no secondary interests and with interests which are well established (the two profiles correlate .91).

These six cases very well illustrate the complexities involved in interpreting a man's interest profile.

HOW OCCUPATIONAL CHOICES ARE MADE

How young people choose an occupational goal is largely unknown. Three possible explanations may be advanced with the thought that all three are probably involved in the choices made later in life if not during grammar and high school.

The first explanation is in terms of interests. Certain activities that are liked or disliked are identified with occupations, and so the occupations are liked or disliked. Thus liking mathematics and physics and disliking English is frequently interpreted as liking engineering; the reverse is interpreted as liking law. A great many early occupational choices are seemingly arrived at on this basis.

The second explanation is in terms of social prestige. A boy is continually asked, "What are you going to do when you grow up?" He must have a sensible answer, and be able to defend it, or he "loses face." Any occupational choice is better than none under these circumstances. When defeated in argument he must name a new choice. Since his efforts are in the direction of mak-

ing a good impression upon others, he tends to choose occupations with prestige value. Professions are thus chosen instead of trades, "business" is announced instead of grocer.

Apparently occupations can be eliminated from a list of possibilities more easily than they can be added to such a list. Students can certainly record many more occupations they don't want than they want. It would seem as though fairly stable choices are finally reached by first eliminating many occupations which are not liked or which fail to have the necessary prestige value and then choosing the best-liked occupation from the remainder.

The third explanation involves the preceding two but pertains primarily to the satisfactory adjustment of the personality to its environment. For example, the shut-in type selects opportunities which would never occur to the socially minded "good mixer." Acceptance must be viewed as ranging in individual cases from trivial to very complex considerations. Thus at one extreme is the case where money is needed and the best-paying job is taken, and at the other extreme is the case where there is a profound interest in the social sciences with a feeling that they are not taught satisfactorily and the aspiration to be a leader—eventually a college president—in the reorganization of the curricula.

All three of these explanations involve ability. Interests accompany satisfying activities; social prestige is not long maintained unless there is successful performance of a sort; one's personality-traits are reflections in a rough sort of way of what one does well. The shut-in type may have retreated from social contacts because of failure in such activities or because reading, daydreaming, and other solitary activities bring greater satisfaction.

Carter[10] points out in connection with the third explanation that "the individual derives satisfaction from the identification of himself with some respected group; by this method he seizes some sort of status." Consequently, when he has selected an occupation for whatever cause, he identifies himself with it as he already has done with his family, his social group, his school, etc.

As long as no great discrepancies are felt between ability and the requirements of the vocation, the individual persists with the identification.

[10] H. D. Carter, "The Development of Vocational Attitudes," *Journal of Consulting Psychology* (1940), 4, 185–91.

This persistence is ordinarily sufficient to overcome small obstacles, but when unsurmountable obstacles are encountered the whole process of identification and the whole pattern of adjustment are likely to be disrupted. After such an occurrence, a new attempt at vocational adjustment is likely to be made, with an orientation toward a different occupational group. The new orientation may differ much or little from the earlier one . . . .

The pattern of vocational interests which gradually forms becomes closely identified with the self. The pattern is partly subjective and involves organization of activities around judgments of the value of things. It leads to persistence in selected lines of activity even in the face of obstacles, when those activities are seen in relation to the expanded ego; it leads to avoidance of other activities as unimportant. It tends to put an orderly pattern into relevant aspects of living. It gives the individual major drives, together with bases for long-time planning.

The vocational interest patterns of young persons tend in the main to become increasingly practical. These patterns consist, basically, of a series of approximations in the attempt of the organism to fit itself with its biological qualities into somewhat rigid social structures. In the beginning, many of the interest patterns found among young people are very unsatisfactory solutions to their problems of adjustment. Attempts are made to make the solutions work, but frequently this is impossible. After disruption of the pattern, a new pattern is developed, and it may be a better one; if so it may last indefinitely, otherwise the process is repeated again. For a given individual, the pattern of interests may become more satisfying, or less satisfying as growth continues, or it may remain on the same level of satisfyingness. Persistence in a bad pattern leads to increasing disappointment and frustration; a series of bad patterns may lead to complete breakdown of personality organization, even to the point of a psychosis. An individual's happiness may depend largely upon the fortunate choice of a workable interest pattern, and opportunities for growth toward success in the chosen occupation. For each individual there are probably several workable patterns and many more un-workable patterns which are prevalent in our culture and to which the individual is exposed. The pattern of interests is in the nature of a set of values which can find expression in one family of occupations but not in other families of occupations.

In commenting on this theory, Darley says:

Persistence in a bad pattern has other possible outcomes. Specifically, adult cases whose modal occupations are in conflict with their primary interest types can do one or more of the following: (1) develop socially acceptable and compensatory hobbies; (2) develop personality conflicts at home or on the job, but still keep the job; (3) re-define the specific job duties more in line with the activities of the primary interest type, so that while the job label is unchanged the job duties are relevant; (4) establish a sufficiently poor work record to be only marginally employable (without

promotion) or to be separated from the job. Since re-employment is usually in line with past experience, cases in this latter category may show a work history of many specific jobs, unless they can get a job in another interest type.[11]

Among college students and college graduates shifts from one occupational goal to another are common. It is not necessary for one to continue indefinitely in a wrong occupation, but men with dependents and no outside financial resources frequently are unable to make a change when they have discovered their situation. Among college students there are cases of conflict between interest and seeming duty. Some fathers, for example, insist their sons shall take a certain course or they will not finance the son's education. Loss of interest and poor grades bring some of these cases to a counselor. We do not know how many others keep on regardless of personal wishes nor what price they pay for forcing themselves to do so.

HOW TO EXPRESS OCCUPATIONAL INTERESTS TO STUDENTS

Probably no one has had more experience in interpreting interest scores to students than Darley of the University of Minnesota. Out of "bitter experience" he points out the right and the wrong way of presenting interest scores.[12]

The wrong way is to make the bald statement: "You have the interests of a Y.M.C.A. secretary or of a personnel manager." Darley points out the following objections to such an approach. First, the occupation may arouse certain conceptions, certain stereotypes, the student has acquired of the occupation and it often takes a great deal of time to discover what they are. Until his views are ascertained the counselor and the student are using the terms with different, sometimes utterly foreign, connotations. Second, the student is very likely to think that the statement means that he has not only the interests but the abilities called for in the occupation. If he doesn't agree, he objects to the conclusion. Third, the student, never having had such an occupational experience, wants to know how you can say such a thing. This forces

[11] J. G. Darley, *Clinical Aspects and Interpretation of the Strong Vocational Interest Blank* (Psychological Corporation, 1941), pp. 57–58.

[12] J. G. Darley, *ibid.*, chapter vi.

an explanation as to the test procedure, etc., which interposes a bad digression at the time you desire the student to concentrate on the conclusion. Fourth, the student may accept the conclusion without giving it very much consideration and jump to the irrelevant factors of opportunity, income, prestige value, etc. Once a student starts asking, "How much will I earn the first year?" and "How much will I earn after five years?" etc., it seems well-nigh impossible to get him to consider the basic factors that should control a vocational decision. Fifth, until the counselor has a good idea of the man's abilities it is unwise to suggest a definite occupation, because later on when inferior abilities are ascertained the counselor will have to divert the client to a lower-level occupation. The younger the client, the more all these objections hold: guidance toward a general field and not toward specific activities is preferable with high-school students and even college freshmen and sophomores.

The best procedure is to withhold the interest scores until the student has been prepared to hear them. The counselor must first ascertain interest scores plus all the evidence he can secure regarding the individual's abilities, experience, and presumed capacity to forge ahead. He should then proceed to draw the student out as to his own plans. Those that are in harmony with the counselor's conclusion can be utilized to direct the student in the right direction. Those that are not in harmony must be considered and the student's reasons carefully analyzed in order to ascertain which are good and which poor ones. It is frequently necessary to send the student away to look up information pro and con regarding his aspirations in order to lead him to realize that his views are not substantiated by the facts. The writer has found the question, "What do you daydream of doing 15 years from now?" of very great value. This often discloses that the student's expressed desires represent quick ways of earning money which will make it possible to do something else later on. If the "something else" is a possible vocation, it should be carefully considered as the real occupation to enter.

Far too many students want to do personnel work, usually with only the haziest idea of what is involved. It appears to the writer that many of these men and women are looking for a soft berth

where all they will have to do is to give advice. The writer's method of dealing with this situation is to ask, "If you were president of such and such a company, would you hire a recent college graduate to handle your personnel problems?" Inevitably, the student says "No." Then he is asked to give the requirements he would look for in such an assistant. Some of them use their imaginations pretty well in this connection. When he has stated all the characteristics of a good personnel man that occur to him, he is directed to references where he can learn more. He learns that several years of hard work must intervene before he can be ready to be a personnel manager. One who still remains interested is now ready to consider the proper means of reaching this goal.

In presenting interest scores the student should visualize himself as located at a certain point on the surface of the interest globe and to note the occupations which are located in that neighborhood and those that are not. He should be made to realize that there are thousands of occupations, not merely those few for which scores can now be obtained; and that it is up to him to consider all possible occupations which are similar to those on which he scores high. The more he realizes that the 34 occupations listed on the report blank are merely indicators of thousands of occupations, the less he feels bound to enter the one occupation on which he scores highest.

Use of individual items on the blank.—Shellow[18] has called attention to the use of the *Interest Blank* in interviewing employees for selection and for guidance of those seemingly not well placed. She points out the difficulty of establishing "rapport" in many cases and the implications of an interviewer asking many questions which too often put the subject on guard rather than free him to express his own ideas and feelings. She has found that an applicant or an employee is quite willing to express his likes and dislikes on the blank and that once this has been done it is easy to call attention to them and to lead the individual to consider their significance. Thus the individual reveals his past experiences to justify his responses and the interviewer becomes surprisingly well

[18] S. M. Shellow, "Vocational Interest Blank as An Aid to Interviewing," *Personnel Journal* (1931), **9**, 379–84.

acquainted with the applicant. Moreover, whatever conclusions are drawn are easily accepted, since the evidence has been presented by the candidate himself.

There are times when the interest blank can be thus used without scoring it. This is so when the applicant is being considered for occupations for which there is no way of scoring today. But it is sheer folly for anyone to think he can read the responses of an applicant and guess his occupational interests anywhere nearly as well as by scoring the blank. When the scores are known, the individual responses can be discussed as outlined above to genuine advantage. Their use is to establish rapport and to cause the client to reveal himself.

Any enthusiasm better than none.—There is plenty of enthusiasm for *play* but relatively little for *work*. Educators have not yet learned how to develop enthusiasm; the least they can do is not to quench the spark. Consequently, when an adolescent wants to engage in some hobby or job unrelated to his future vocation, it seems far preferable to encourage him in such an undertaking than to force him to prepare for his vocation and run the chance of dampening his enthusiasm. The high-school boy who is interested in photography will obtain a lot of fun in pursuing the hobby and at the same time will learn at an early age to work hard and seriously and for quite a long time in order to accomplish his purposes. Moreover, he discovers that pleasure can come from work. Is there anything more valuable that he can acquire at that age?

This does not mean that vocational guidance should be dispensed with. From time to time present the facts, see that they are understood, and give the boy time to grow into the new program. Most adults did not decide their careers while in high school; many did not do so until after graduation from college. It is futile to expect all young people to decide by any given date. All of us have to try many things, and we learn from failures as well as successes what we can do and want to do. Encourage the boy to try all manner of things. Keep before him the facts relative to his abilities and interests; have faith that the facts will be appreciated in time. Remember the "facts" at the disposal of a counselor are never all the facts about the boy.

Some of the difficulty in getting young people to adjust themselves to their economic environment comes from their daydreaming of doing only pleasant things and their belief that somewhere there is a place for them which will be "just lovely." It seems to the writer that this attitude is intensified today more than ever because so few young people have chores to do and most young people are relatively free to go to school and do nothing else. Men who succeed have to do many things that are unpleasant. Success involves minimizing unpleasant things and learning how to derive satisfaction from doing what one doesn't want to do. There is, of course, no job that appeals in all its elements to even the most enthusiastic performer. The most ardent inventor, author, or scientist may lose himself in his work for a time, but sooner or later he must force himself to keep going.

School work provides frequent change in assignments, coupled with frequent grading of the work done. Most jobs consist of doing a few things over and over again for months with almost never any comment by anyone about it unless it is unsatisfactory. It is not surprising that many young people find their first jobs so uninteresting—their school environment has been a poor preparation for what they must do after graduation. Somehow young people need to be taught to do routine work, whether they like it or not, that is, to do what is unpleasant when it is necessary in order to achieve their goal. How much a counselor can do here is unknown to the writer. He confesses that far too often he says to himself, if not to the student, "After you have butted your head against a stone wall for a while, we can talk sense." What can one do with a college senior who wants to be "an economic adviser to the U.S. and to the world in general" and hasn't the haziest idea what he would say if sent by the government to counsel a gathering of farmers, or housewives, or longshoremen!

The project method of teaching aims to develop worth-while work habits through having students do what they want to do. On the way they will almost always, if they reach the goal, find plenty of unpleasant tasks. The theory is good; the execution is not always easy. The theory can be applied in counseling by encouraging students to pursue whatever they are enthusiastic about (within reason of course). The student who has ridden twenty hobbies

hard for six months each during his life from ten to twenty years of age is far better prepared for life than the student who started at ten years of age to prepare for an occupation for which he has never had any real enthusiasm. The latter has never had the fun of living, while the former has experienced it in a great variety of ways. The counselor can save the enthusiast from some mistakes and can help him appreciate what his experiences mean as to his abilities and interests; he can aid the plodder to find some aspect of his duty that is fun for him.

The ideal of guidance should never be mere efficiency. Most of us are average persons with average abilities and will perform in an average way. The ideal of guidance is that each will find work to do which he will enjoy. To enjoy it for long it is necessary that the work be done acceptably; thus efficiency is involved. Efficiency does not necessitate enjoyment, but enjoyment does involve efficiency.

Chapter 18. Use of Interest and Aptitude Tests in Counseling

In order to illustrate how interest- and aptitude-test profiles may be analyzed and a constructive counseling program determined on the basis of both, the writer requested Dr. J. G. Darley to supply several cases such as he handles at the Testing Bureau of the University of Minnesota. Three of these cases are presented below, as written by Darley except for a few editorial changes.

The Testing Bureau is an all-University agency established in 1932 by the Board of Regents for purposes of educational, vocational, and personal guidance. At the present (1941–42) stage of its development, approximately 4,000 students a year are interviewed by its own counseling staff after being given an average of ten tests in the Bureau's testing room. In addition to the variety of test scores resulting from ten measurements, among which the Strong *Vocational Interest Blank* is included, the Bureau's staff collects grades, health-service reports, reports from other counselors, entrance-test scores, and all special test results elsewhere available on the student when he comes to the Bureau.

These data are used in counseling interviews, an average of two or more of which are held with each student. The Bureau maintains a follow-up policy which brings back each year approximately 25 per cent of the annual case load for subsequent case work. The Bureau attempts to maintain contact with a student until he has arrived at a point of satisfactory adjustment in his University career. All such contacts are voluntary in nature and the Bureau exercises no compulsion over its cases.

In addition to this intensive clinical program with individual students, the Bureau is responsible for the administration of the state-wide testing program in which approximately 25,000 students each year are given one test in scholastic aptitude and one

test of achievement in English. The colleges and divisions of the University also request the Bureau to give tests for purposes of selection, classification, and guidance during the Freshman Week period and the subsequent registration period. Tests given and scored by the Bureau, exclusive of those it uses for individual counseling of its own cases, run to approximately 100,000 tests per year.

CASE OF JOHN JONES

This case presents an interesting clinical picture of transiency in educational-vocational choices. The transiency is tied up with one of our hypotheses regarding the nonoccupational keys on Strong's test: Cases having low occupational-level scores which accompany claimed choices not consonant with the measured interests show some form of deviate behavior.

General findings.—This student appeared first in the Bureau as a pre-college case the week before he registered at the University. At that time he was eighteen years old (1938). He stated his problem as follows: "I am undecided as to what vocation I am best suited for." His expressed choices were medicine, engineering, and pharmacy.

a) *General academic ability.*—As can be seen from the test profile (Fig. 36) the boy has a percentile rank of 59 on the American Council and 93 on the Ohio Psychological. In each case the norm groups are freshmen in this university. The American Council was given in the state-wide testing program in February 1938. It is the 1937 form of the test. The Ohio was given as a checking test of general ability when the boy came to the Bureau. Since we know that the raw score on the American Council made by the average arts-college freshman has the approximate percentile of 53, this boy is close to the average entering student. The very high score on the Ohio Psychological Test is partially accounted for by the non–time-limit conditions of testing and by differing annual populations in the two norm groups. If we take a clinical approximation of these two scores we can see that the boy is probably a slightly better than average risk for university work from the standpoint of ability alone.

b) *General achievement.*—Look first at the high-school rank

(Fig. 36), representing the status within graduating class based on 3½ years of high-school work. The boy was in the top 10 per cent in a high school whose senior class numbered only 56 graduates. We know that high-school ranks from small graduating classes in rural or semirural areas need to be discounted somewhat. However, according to the achievement-test scores, the boy stands in the upper 25 per cent on the English placement test on each of two alternate forms, the 1937 form and the provisional 1938 form of the Co-operative English Test. The norm group includes freshmen at this university. The other achievement-test evidence is a little more confusing. We do not yet have local norms for all of the Iowa series of achievement tests, nor are we completely sure of the meaning of the Co-operative Test Service's own norms for national groups on its high-school tests. However, when you look at the norms that we do have for the Iowa Mathematics Training Test, this student does not do well when compared with local groups, even though he has had a minimum of two years of high-school mathematics. He does quite a bit better on the other tests in the Iowa series and on the physics test as well. With the exception of the mathematics test, the achievement battery represents a fairly nice picture, predicting college success.

As far as other types of achievement are concerned, the boy's work experience includes 4½ years on a newspaper route, and that is about all. His extracurricular activities include athletics, music, dramatics, and debate. It is regrettable that we cannot get good estimates of achievement on these youngsters for their work experience or activities experience. Much valuable material of this kind could be used in counseling. All we can do is trust to their statements and their expressions of interest in or liking for the activities involved.

c) *Special aptitudes and disabilities.*—One relevant disability is to be found in the speed-of-reading test, on which the boy falls in the lowest quarter of the entering freshman group. This partially explains the discrepancies between scores on the time-limit and non–time-limit tests of ability mentioned earlier. Because of time limitations during Freshman Week, no aptitude tests of a performance nature were used in this boy's testing. It is probable that any such tests would have been somewhat irrelevant in his

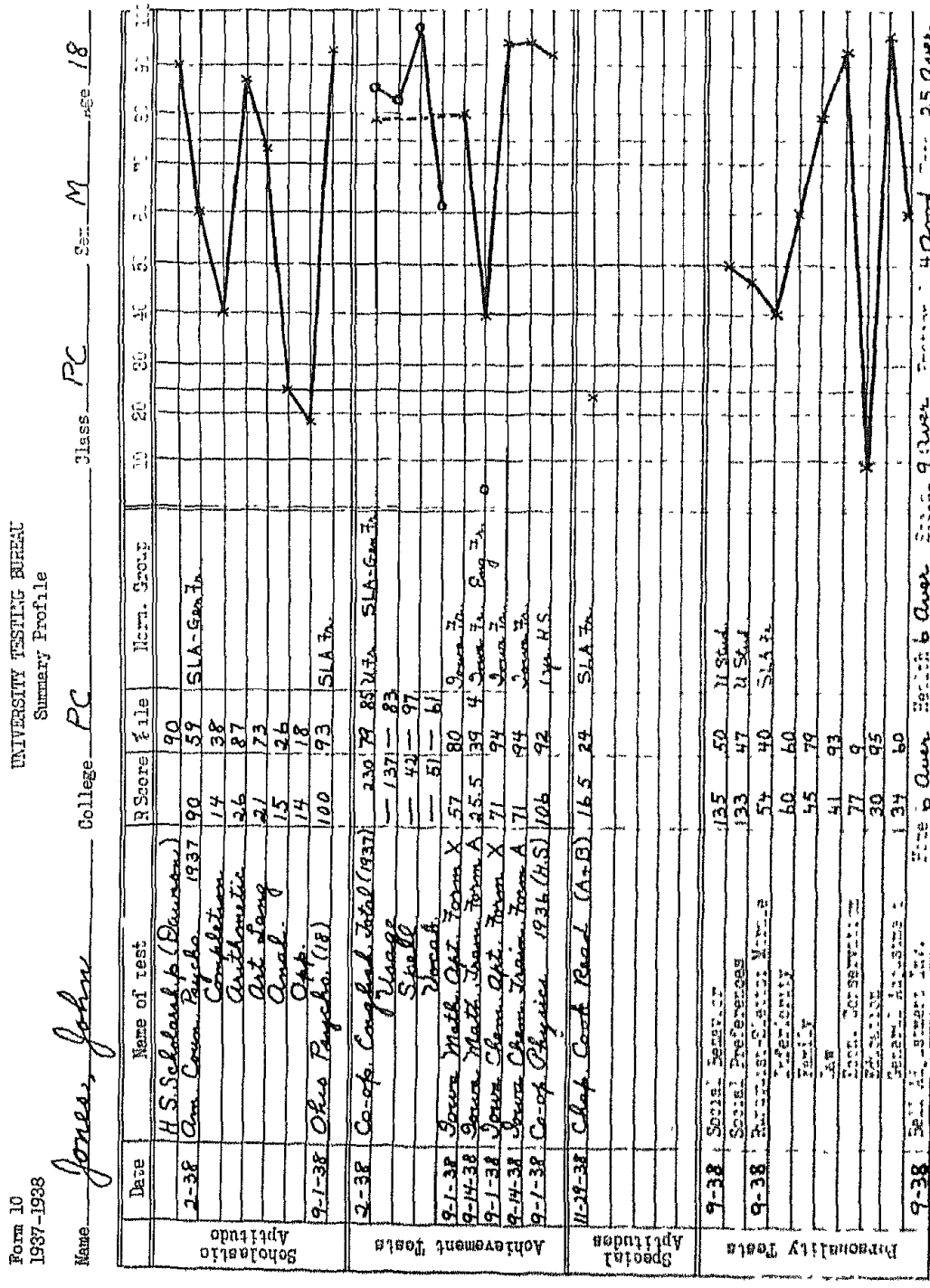


FIG. 36.—Scholastic and personality scores of John Jones, age 18 years.

case. Furthermore, even though the two tests in the Iowa series are labeled "aptitude tests," we have found rather high correlations between these so-called aptitude tests and achievement tests.

d) *Personality characteristics and attitudes.*—The first judgments about this boy's personality come from the preliminary interviewer. She judged him to be "very neatly and well dressed; frank, talkative, and straightforward." She also commented that he seemed very undecided about the problem of choice and that he mentioned changing his mind every week or two. She noted that he is the youngest member of a large family and seemed somewhat dependent on the older siblings and the parents. These factors must be borne in mind as the case unfolds.

The second set of evidence regarding personality is found in the battery of attitude and adjustment scores given in Figure 36. There is no outstandingly significant deviate score, with the exception of the liberalism indicated in the low percentile on the economic conservatism–liberalism scale. These personality measures do nothing more than provide clues; they do not make the diagnosis for you, nor do they indicate the treatment.

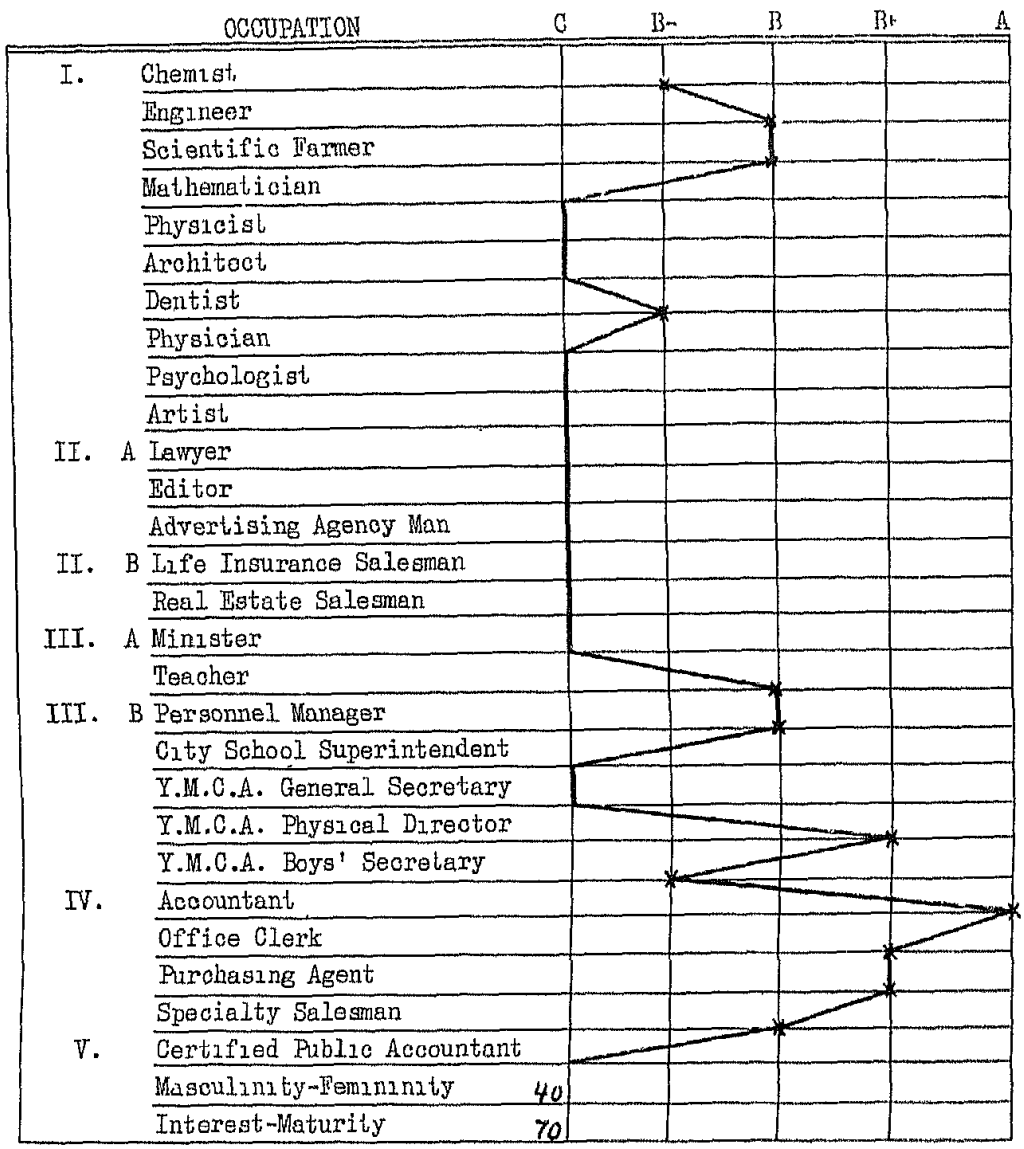
The third judgment of personality is that made by the counselor, and it appears as a thread running through the case notes of my eight interviews with this youngster. The judgment is one of definite overdependence on the family and lack of a stable educational or vocational motivation.

e) *Socio-economic background.*—The boy's father was a doctor. He died in 1931. The mother, who is still living, had two years of high school. There are five brothers and sisters, all of whom have had at least four years of work in this university and two of whom have had professional training in the fields of social work and medicine. As you will gather, there is a tremendous educational tradition in the family which makes this case increasingly difficult. Both parents are native born. The family lived in a very small community until this fall, when they moved here to Minneapolis. The boy mentioned several times in the eight interviews that he is anxious to get into school so that he may make new friends and be less lonely.

The boy's magazine-reading interests are at or slightly above the median cultural level as scaled on the Morgan-Leahy Scale.

SUMMARY OF RATINGS ON STRONG VOCATIONAL INTEREST BLANK

MEN



OCCUPATIONS LISTED BY STUDENT (In order of preference):

1. Physician
2. Civil Engineer
3. Teaching
4. Mech. Engineer
5. Pharmacy

FIG. 37.—Interest scores of John Jones, age 18 years.

He reads the *Reader's Digest*, *Life*, the *American*, and the *Saturday Evening Post*.

In general, we may see that the boy comes from a very adequate family background. There is no major financial problem that will hinder his school progress, and the cultural level of the family is above the average of the university population.

f) *Health.*—Neither at the time of this first counseling contact nor later when we checked the entrance physical examination were there any health problems in this case.

g) *Interests.*—This is the point in the analysis where some of the clinical findings emerge more clearly. As stated earlier, the boy claims choices in medicine, engineering, pharmacy, and, in addition, teaching. At the same time he admits he is undecided not only right now but also as to what he would like to be doing ten to fifteen years from now. It should be fairly obvious that the choice of medicine can be traced directly to the family situation. As a matter of fact the boy said in the preliminary interview that it had always been taken for granted that he would be a doctor. He is not so sure, however, and then says: "I am too much of a chicken to operate on people, I guess."

When we asked him about his claimed group interests, he listed, first, those jobs involving social-service activities; second, jobs involving technical or scientific work; and, third, jobs involving business-detail work.

Consider now the first measurement evidence (Fig. 37)—the interest test given in September 1938.[1] In this pattern analysis a preponderance of A and B+ scores in any factor-analyzed group represents a primary pattern, a preponderance of B+ and B scores in any factor-analyzed group is a secondary pattern, and, finally, a preponderance of B and B— scores in a factor-analyzed group is a tertiary pattern and is probably worthless for positive guidance. However, if the tertiary pattern is accompanied by a low interest-maturity percentile, you have some hope that periodic retesting will indicate the emergence of a pattern that will be more stable from the counseling standpoint.

In this case the interest-maturity percentile at the time of the

[1] Note that the original interest scales were used and the original grouping of occupations was based upon those scales.

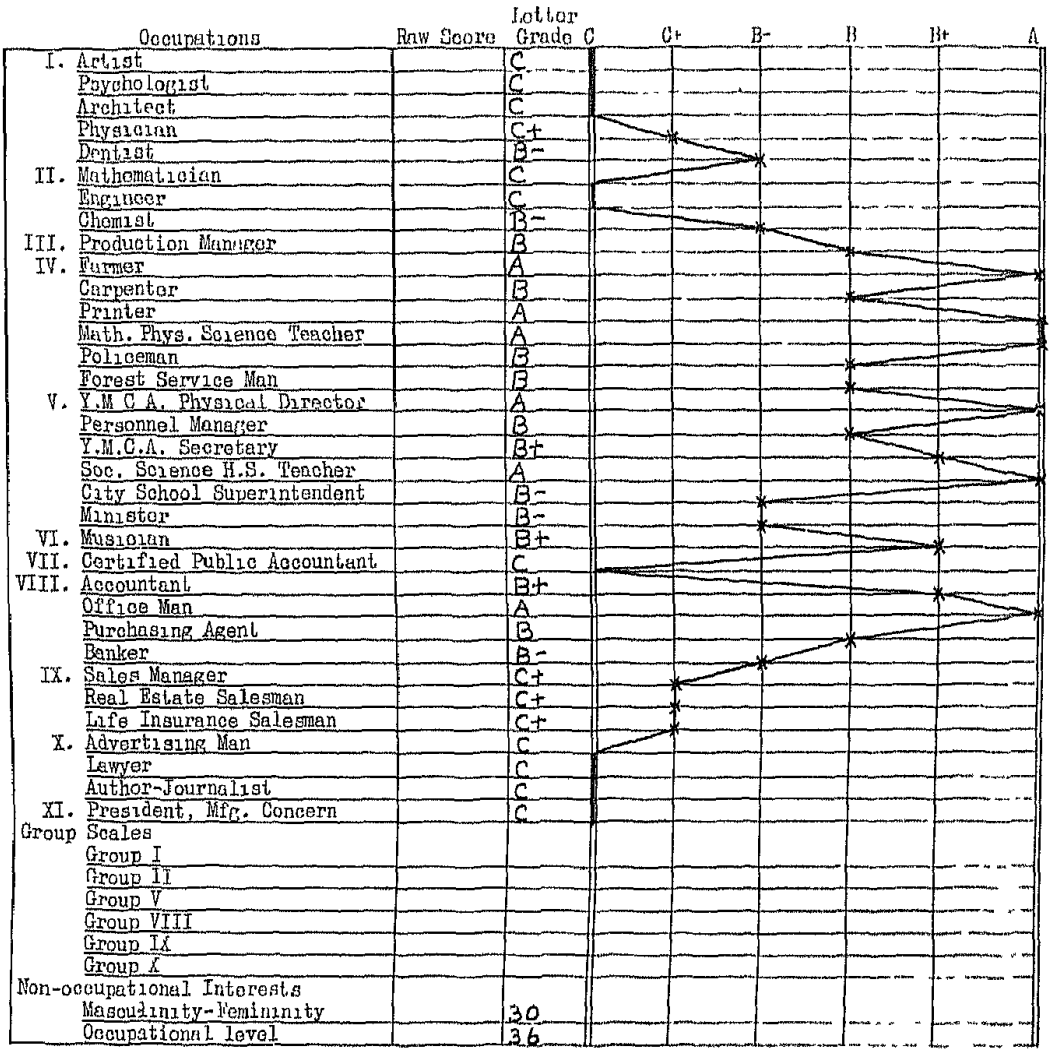
U.T.B. Form 11A Case No. 9444

Name Jones, Johnson Age 19 Date 5-39

Person or agency forwarding for scoring UTB

SUMMARY OF RATINGS ON STRONG VOCATIONAL INTEREST BLANK - MEN

	Occupations	Raw Score	Letter Grade
I.	Artist		C
	Psychologist		C
	Architect		C
	Physician		C+
	Dentist		B-
II.	Mathematician		C
	Engineer		C
	Chemist		B-
III.	Production Manager		B
IV.	Farmer		A
	Carpenter		B
	Printer		A
	Math. Phys. Science Teacher		A
	Policeman		B
	Forest Service Man		B
V.	Y.M.C.A. Physical Director		A
	Personnel Manager		B
	Y.M.C.A. Secretary		B+
	Soc. Science H.S. Teacher		A
	City School Superintendent		B-
	Minister		B-
VI.	Musician		B+
VII.	Certified Public Accountant		C
VIII.	Accountant		B+
	Office Man		A
	Purchasing Agent		B
	Banker		B-
IX.	Sales Manager		C+
	Real Estate Salesman		C+
	Life Insurance Salesman		C+
X.	Advertising Man		C
	Lawyer		C
	Author-Journalist		C
XI.	President, Mfg. Concern		C
Group	Scales		
	Group I		
	Group II		
	Group V		
	Group VIII		
	Group IX		
	Group X		
Non-occupational Interests			
	Masculinity-Femininity		30
	Occupational level		36



Occupations listed by student:

1. _____
2. _____
3. _____
4. _____
5. _____

Classification of occupations:

_____ Business contacts with people
_____ Business detail work
_____ Social Service activities
_____ Special artistic abilities
_____ Technical or scientific work
_____ Verbal or linguistic work
_____ Executive responsibilities

FIG. 38.—Interest scores of John Jones, age 19 years.

first testing was rather high, indicating that not much change can be expected in either the level or type of interest-test scores. There is obviously no primary or secondary pattern in the technical Group I, which includes medicine, where we would expect a primary pattern to be found if the boy's claimed and measured interests were consonant. There is a limited primary pattern in the office-detail group (IV) and at best a tertiary pattern in the social-service or uplift occupations grouped under Roman numerals III-A and III-B. These were the data available at the time of the first counseling interview in September 1938. Later we retested the boy on the revised Strong Blank (Fig. 38). In this regard remember that it is easier to get higher ratings on the revised Strong scales than on the unrevised.[2]

On the revised Blank you find again no technical or medical pattern. You find again about the same magnitude and intensity of the pattern in the business-detail group and in the social-service or uplift group, under the new Roman numerals indicating the groupings of specific keys in the new factor analysis. However, on the new Strong Blank two additional items of information emerge, both of which are related. The boy's scores are high on the keys for the lower-level occupations in Group IV. Furthermore, the boy's occupational-level score, one of the nonoccupational keys, gives some clue to what we may call level of aspiration. I am becoming clinically more convinced as I see these cases that the occupational-level score is an excellent quantitative statement of a form of motivation or level of aspiration or some other dynamic aspect that is vaguely referred to in the literature as "drive."

Almost one year and nine months elapsed between the dates of the two testings on the Strong Blank, and the test-retest scores are surprisingly consistent in this boy's case, even with the use of two different forms of the test.

Diagnosis.—We have taken quite a bit of time to break this case down into the areas of systematic case analysis. Now we must rebuild the data into a working diagnosis as a basis for counseling and treatment. In the first place, I should say that the boy shows the symptom of vocational indecision. He shows a limited reading

[2] See p. 649.

disability, and he shows also a conflict between the specific occupational choices that he expresses and the measured occupational-interest patterns. He shows some overdependence on the family; he has not yet learned to stand completely on his own feet or to make his own decisions. There is no health problem, no financial problem, no problem in study skills, and no marked personality maladjustment.

I would emphasize that the vocational indecision seems to be symptomatic of the basic problem rather than the basic problem itself. It seems to be a symptom of the boy's unverbalized attempt to resolve the conflict between what the family expects him to become and what the interest-test evidence tells us he probably will become ten or fifteen years from now.

Counseling.—Now let me summarize briefly my notes on the eight counseling interviews that I have had to date with this boy. Remember that he has the basic abilities to make him a pretty good college risk but that it might be wise for him to avoid too much mathematics and to do something about his reading speed. Remember also that Strong's Blank was not designed to predict curricular success, although its use in occupational guidance at this age simultaneously makes it a springboard for curricular differentiation within a university of this size.

In my first interview I discussed with the boy his possible difficulties with mathematics as it would relate to engineering and suggested on the positive side that he consider one of the sequences relating to the School of Business or to the departmental work in the social sciences. I also raised some question regarding the intensity of his claimed interest in medicine, and he was perfectly willing to admit that the choice wasn't very insistent. I found that his sister had mapped out the first quarter's program for him in the pre-medical course. Since I was talking to the boy before classes started, I suggested an alternative program with one science, three social sciences, and English for the full first year. It was at this point that he insisted he would have to talk this over with the family, although he admitted that the program was more to his own liking.

He came in to see me at the middle of the fall quarter, and his grades were slightly below average—certainly not outstanding at

that time. In this interview we worked on the reading disability, and I outlined the treatment that would result in increasing his speed of reading. In this interview also he began thinking of his own vocational choices and was talking about being a scout executive or a camp leader during the summer and teaching high school during the winter. In preparation for the winter quarter's work I assigned him to a how-to-study class, but he did not go on into that class; fortunately the remedial work on the speed of reading showed improvement such that his grades improved and he had thirteen hours of C and three hours of B at the end of the fall quarter. It is interesting to note his reason for refusing the how-to-study class—some friends told him it wasn't very good. This uncritical acceptance of any suggestion is most characteristic of the boy.

In the winter quarter he shifted back to an easier composition course, and when he came in in that quarter he was talking about graduate work and emphasizing again that he would be a high-school teacher if he could be sure he wouldn't have to work too hard and if the field wasn't somewhat underpaid. The line of influence here is his high-school superintendent, whom the boy respected a great deal and whom he wished to emulate even to the point of identical occupational adjustment.

At the end of the winter quarter his grade record was about the same, but he still was no nearer making a vocational choice; when I saw him in the spring term he announced that he definitely disliked the economics course I had urged him to take as a tryout for the type of study he might do if he went on into the School of Business. In this spring interview he was sure that he wanted to teach zoölogy or biology in high school, but he again talked about graduate work in relation to a degree in educational administration. When he checked the requirements for the teaching major in the natural sciences, the boy gave up the idea quickly because he found that he lacked specific subject-matter requirements and would have to spend more time than he had planned at the beginning. It was at this point in the counseling that I retested him on the *Vocational Interest Blank.*

I saw him about two weeks later to discuss the new test evidence, and just before school closed in June I urged him to make up the

requirements for the natural-science teaching major in the light of his scores on the revised Strong test.

The boy then went away for the summer and came back to see me again in September. This time he announced that he was going on into the field of bacteriology and again was going to do graduate work. Begining now to recognize the transient nature of these choices, I let him hold on to the idea of bacteriology and sent him back to check on the academic requirements for this field. It is interesting to remark that he had 45 credits and 58 honor points for the first year's work in the university, which represents slightly better than a C average.

In December he returned with the idea, quite definite, of going into dentistry. At this point I made the boy count the number of specific vocational choices he had made in these four quarters in school. With minor variations and modifications they were as follows: medicine, engineering, pharmacy, education, summer-camp work, natural-science teaching, bacteriology, and dentistry. He had disregarded the alternative of work in the School of Business Administration because of a casual dislike of one economics course, and he had not considered too seriously the social-science work. As a matter of fact, it is interesting to note that he does not often relate his occupational choice to the curricular preparation for that choice.

When he had recited all nine choices, he was perfectly amiable and interested but missed completely the transiency that they represented. Fortunately some of the nine specific choices which he mentioned are within the scope of the lower-level pattern on Strong's Blank. Eventually he will be unable to avoid being shaken down into one of the occupational choices in this lower-level group.

At my last interview with him this spring, he said he must make a decision between one of two fields—bacteriology or the science-teaching major. He immediately contradicted himself, saying that if he took the science-teaching major he would be sure to come back each summer for graduate work in education in preparation for administrative work.

Again, in his second year, his grades averaged better than C, his casual dislike for certain teachers and certain subjects per-

sisted, and he still was relatively unconcerned with the necessity for making a final choice.

The case work is certainly not completed; but, as is true in so many cases, time operates on the side of the counselor, since at each point when we plan his program we bring him more nearly in line with the curricular requirements for a job consonant with the interest pattern.

In counseling we have long been disturbed by students whose specific choices range over a large number of occupations and who never stick to any one choice for very long. I believe this clinical phenomenon of transiency will be found to accompany a large proportion of cases in which the occupational-level score is low and the original claimed interests are in conflict with the measurement evidence.

We are now testing experimentally another hypothesis, which is also somewhat apparent in this case, i.e., the lack of adjustment in students whose interest-maturity score is high but who have neither a primary nor a secondary interest pattern as defined earlier. A phase of that hypothesis is to be demonstrated in the next case.

CASE OF FRANKLIN BROWN

Counselors are frequently bothered by cases in which the interest test evidence is inconclusive. No dominant interest pattern appears in the measurement and thus there is difficulty in making suggestions regarding curricular choices. When such cases occur one should be most hopeful if they are accompanied by low scores on the interest-maturity key, since such scores give some hope of the ultimate emergence of a pattern.

You will also frequently hear the statement that this test must be markedly influenced by the environment in which the case operates. Carried to the extreme, this type of logic means that the person's job interests and abilities are primarily formed by the job, whereas in counseling we work, on considerable evidence, with broad interests and abilities and personality characteristics which are molded prior to job competition. It is only if we hold to this latter point of view, partly hereditary and partly developmental, that we can do guidance.

1937-1938

UNIVERSITY TESTING BUREAU
Summary Profile

U T.B. Case No. 10675

Name Brown, Franklin College I. T. Class Senior Sex M Age 21

	Date	Name of test	R Score	%ile	Norm Group
Scholastic Aptitude		H.S. Scholarship (Harding)		88	
	3-34	College Aptitude Test A.M.		76	SLA Fr.
	1-17-39	Am. Coun. Psycho. 1935	293	96	SLA Fr.
		Completion	46	73	
		Arithmetic	72	100	
		Ast Lang.	45	54	
		Anal.	46	93	
		Opp.	84	89	
	1-18-39	Miller Anal A	69	76	Jr. Sr. in Ed
Achievement Tests	3-34	Co-op. English U.S.		53	SLA Fr.
	1-18-39	Co-op. Gen. Science (Coll) 1937	79	77	SLA Soph
	1-18-39	Co-op. Cult. Math. 1938	50	99	SLA Soph
Special Aptitudes	1-17-39	Minn. Cler. Numbers	114	84 20	Gen pop Cl. wkrs
		Names	108	84 24	Gen pop Cl. wkrs
	3-1-40	Spatial Relations	869	97	Gen pop men
Personality Tests	1-24-39	Social Behavior	112	18	U Stud
	1-24-39	Social Preferences	130	41	U. Stud
	1-20-39	Pundmast-Sletto: Morale	52	50	SLA Fr.
		Inferiority	48	31	
		Family	53	46	
		Soc	62	18	
		Econ. Conservatism	80	6	
		Education	46	41	
		General Adjustment	46	6	
	1-24-39	Bell Adjustment Inv.	Home 2 Good	Health 5 Aver	Social 25 Rat Emotional 7 Aver Total 39 Aver.

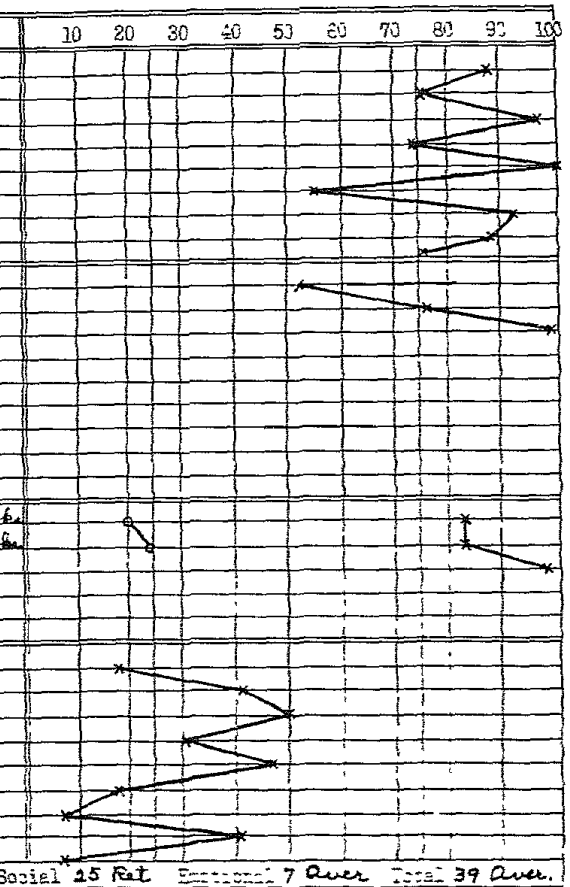


FIG. 39.—Scholastic and personality scores of Franklin Brown, age 21 years.

Over a period of time I have also felt convinced that those students who showed no primary or secondary interest pattern would have some form of maladjustment difficulty in college work. They would either underachieve in relation to their abilities or would switch curricula quite frequently or would drop out of school rather casually. However, we have a study in process of two groups: with, and without, clearly defined interest patterns and with high interest-maturity scores in both groups. To date when we match the groups with and without interest patterns on the basis of an ability test, my hypothesis is not borne out. Yet from the clinical standpoint the problem persists, and the following two cases illustrate the hypothesis.

The first case, that of Franklin Brown, is a student who had no primary or secondary pattern but who did have a low interest-maturity score, which indicated the possibility of eventual change.

I shall not go through the eight or nine areas of the systematic case analysis but I shall ask you in these cases to keep in mind the areas in which the items of tests and clinical data are to be fitted before you arrive at the diagnosis.

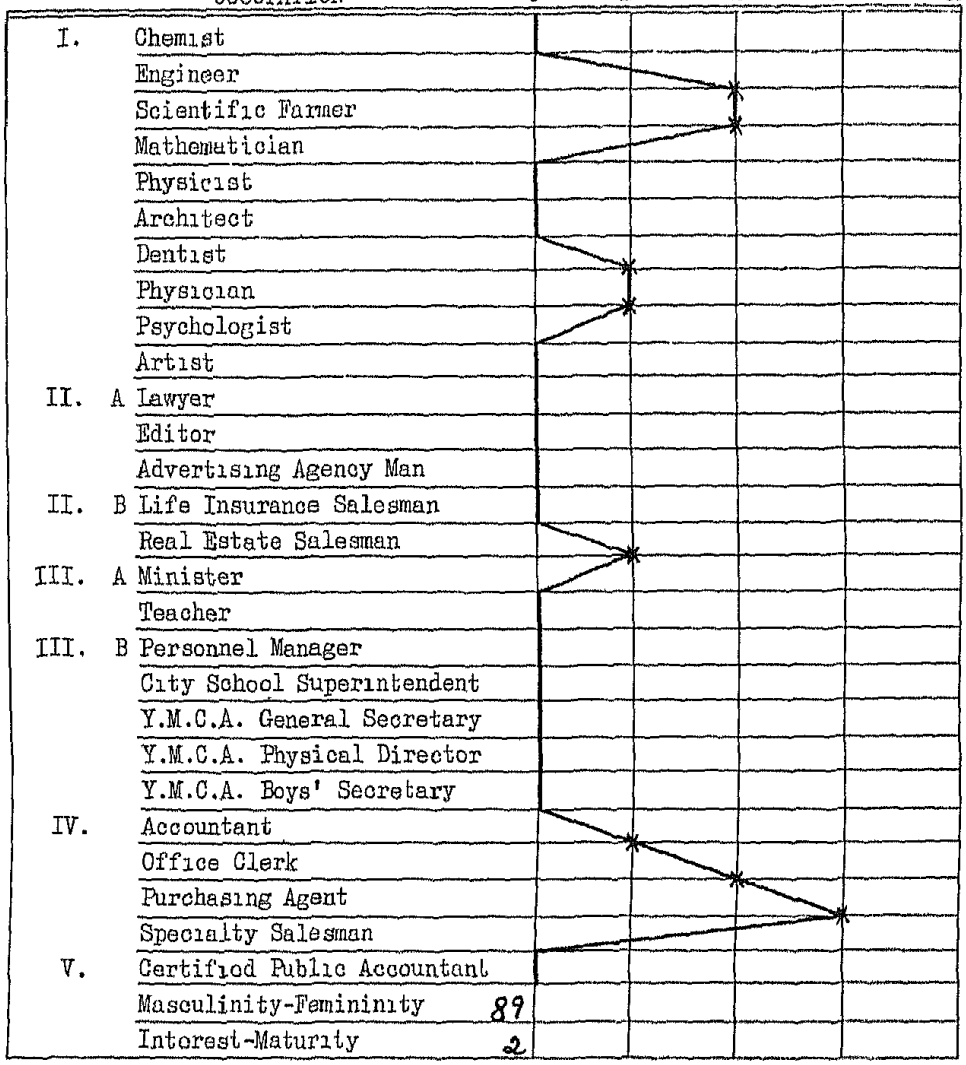
General findings.—This student first appeared in the Testing Bureau in the spring of his senior year in the Institute of Technology. He had entered the Institute directly from a city high school where he had been in the top fifteen per cent of a graduating class of 150 students. Through the four years he had maintained a satisfactory graduating average in the work in mechanical engineering.

At the time of his entrance into the university the placement tests of the state-wide testing program (Fig. 39) located him in the upper half of college freshmen, and he looked like a perfectly good risk, as he later turned out to be in terms of grades. There are few available standard tests for people as far advanced as he was when he came to the Bureau, but you may see from the profiles what we did in his case. We gave a checking test of academic ability, the 1935 American Council test. We gave two of the Co-operative Achievement Tests and used available sophomore norms, and we gave the usual large battery of personality measures (Fig. 39), in addition to the *Vocational Interest Blank* (Fig. 40).

He stated his problem at this time as a desire for a check-up on

SUMMARY OF RATINGS ON STRONG VOCATIONAL INTEREST BLANK

MEN



OCCUPATIONS LISTED BY STUDENT (In order of preference):

1. Mech. Engineering
2. Math. Teacher
3. Accountant
4. _____
5. _____

FIG. 40.—Interest scores of Franklin Brown, age 21 years.

his aptitudes for his chosen field, mechanical engineering. His other specific choices included the teaching of mathematics and the field of accounting. He hoped to specialize in heating and ventilating work, and ten or fifteen years from now hoped to be in this field making a lot of money. This meant $300 a month.

His work experience was of a routine semiskilled or unskilled nature and included a series of odd jobs of advantage solely for the help they gave in financing his education.

From the personality standpoint the preliminary interviewer noticed first that he was somewhat apologetic about coming in so late in his college career to check on the validity of his curricular and vocational choice. He was pleasant but rather colorless in the interview situation. In terms of the test evidence in the area of personality he appears to be very unaggressive and a rather unadjusted individual.

Now study carefully the first vocational-interest test that we gave to this boy (Fig. 40). It was the old form of Strong's *Vocational Interest Blank* and there was little conclusive evidence to back up his claimed interest in engineering. Under our method of interpretation he had no more really than a tertiary pattern in the technical group under I. By generous interpretation he might be said to have a secondary pattern in the business-detail group under IV. At best, however, in spite of specific claimed choices and in spite of almost four years of engineering training, he does not look like the typical engineer. The low interest-maturity percentile, however, is quite significant in this case. Remember that the boy was 21 years of age at the time of this test.

There was at no time a health problem, a serious financial problem, or an educational disability along the reading or study lines in this case, nor was there any family conflict that interfered with the working out of the counseling.

Counseling.—With this accumulation of evidence, the first counseling interview did not give much promise of being very helpful. The boy wondered whether he should attempt to find a job in the heating or ventilating field or should follow up a lead to a job where another phase of engineering would be involved. When we discussed his problem of under-socialization, he admitted that he had found this a drawback in interviews and in activities

but pointed out that his curriculum had left no time for participation in social activities.

I went over the interest-test evidence with him and suggested only that he might show greater liking for the management end of a production enterprise than for the technical or laboratory phase of the work. I also told him that I was a little doubtful of his choice of engineering and that we might not have recommended the choice had we seen him at the beginning of his college work, in fact, we might have been inclined to recommend a more general course accompanied by periodic retesting of his interests.

He said that he had started out in a combined engineering-business course but had been talked out of it by an older brother, who considered that there were more opportunities in a specific engineering curriculum.

Parenthetically, I am continually astonished at the willingness of adults to advise young people with little or no regard for the data upon which they judge the young people's characteristics.

The student seemed satisfied with the interview, although it had not been very productive, and went on to complete his engineering course.

One year later he was back in my office. I found that he had been employed in the production department and the assembly department of a firm that manufactured electrical refrigerators. His job was quite comparable to the usual first placement of engineering graduates, but he had lasted just eleven months before resigning because of complete and utter dissatisfaction with the job duties.

He came back to me because he had remembered that I had asked why he had chosen engineering in the first place, and he wanted to see what alternatives I might suggest.

I had him re-take the *Vocational Interest Blank* test, using the revised form, which you see on the profile (Fig. 41). The scores were interesting. In the first place, there is now a solid block of "A" scores in the office-detail jobs under Group VIII. There are also some rather high scores in the lower-level occupations under Group IV. But there are still no scores of significance in the technological group of keys, even after one year of work experience. Apparently the year of job experience had brought his interests to maturity but the resultant pattern of interests was at complete

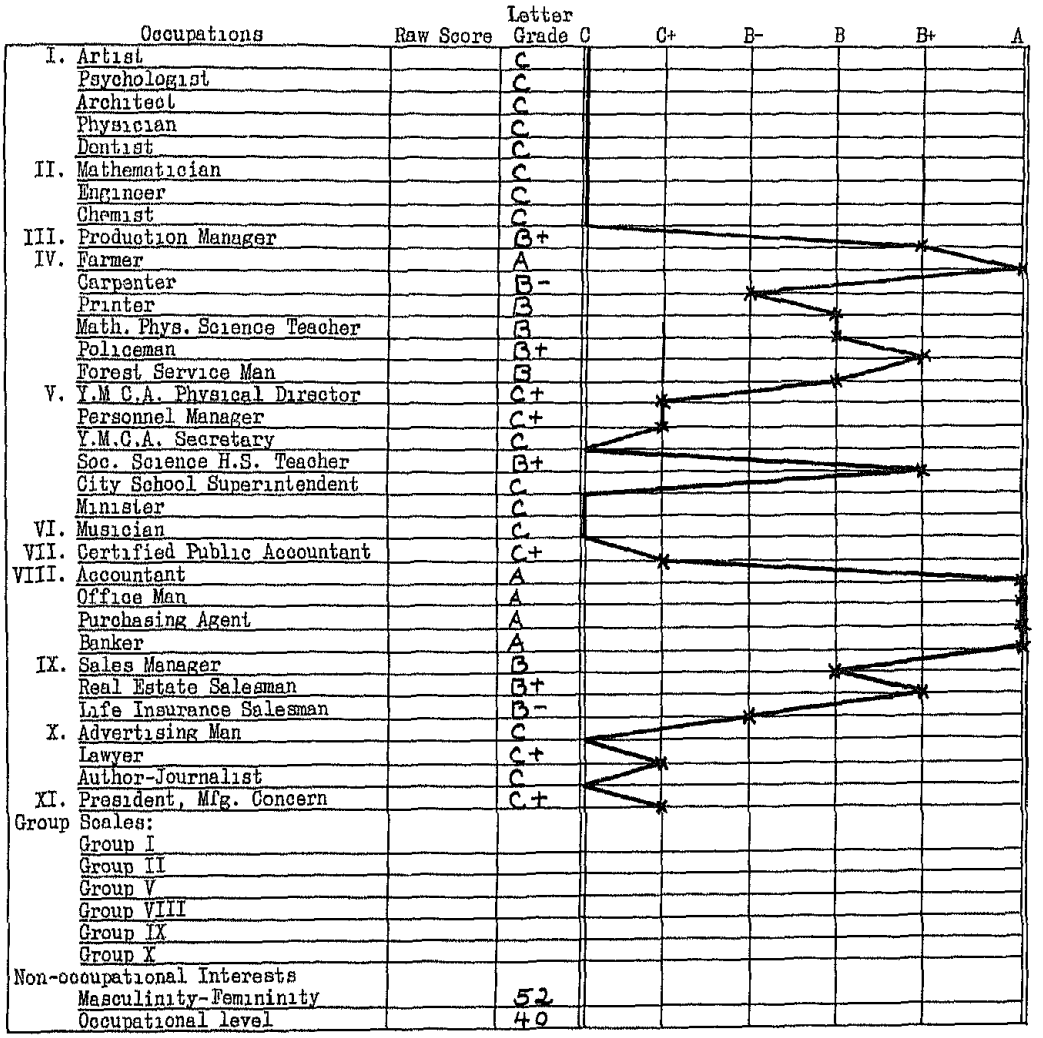
U.T.B. Form 11A Case No. 10675

Name Brown, Franklin Age 22 Date 5-11-40

Person or agency forwarding for scoring UTB

SUMMARY OF RATINGS ON STRONG VOCATIONAL INTEREST BLANK - MEN

	Occupations	Raw Score	Letter Grade
I.	Artist		C
	Psychologist		C
	Architect		C
	Physician		C
	Dentist		C
II.	Mathematician		C
	Engineer		C
	Chemist		C
III.	Production Manager		B+
IV.	Farmer		A
	Carpenter		B-
	Printer		B
	Math. Phys. Science Teacher		B
	Policeman		B+
	Forest Service Man		B
V.	Y.M.C.A. Physical Director		C+
	Personnel Manager		C+
	Y.M.C.A. Secretary		C
	Soc. Science H.S. Teacher		B+
	City School Superintendent		C
	Minister		C
VI.	Musician		C
VII.	Certified Public Accountant		C+
VIII.	Accountant		A
	Office Man		A
	Purchasing Agent		A
	Banker		A
IX.	Sales Manager		B
	Real Estate Salesman		B+
	Life Insurance Salesman		B-
X.	Advertising Man		C
	Lawyer		C+
	Author-Journalist		C
XI.	President, Mfg. Concern		C+
Group Scales:			
	Group I		
	Group II		
	Group V		
	Group VIII		
	Group IX		
	Group X		
Non-occupational Interests			
	Masculinity-Femininity		52
	Occupational level		40



Occupations listed by student:

1. _____
2. _____
3. _____
4. _____
5. _____

Classification of occupations:

_____ Business contacts with people
_____ Business detail work
_____ Social Service activities
_____ Special artistic abilities
_____ Technical or scientific work
_____ Verbal or linguistic work
_____ Executive responsibilities

FIG. 41.—Interest scores of Franklin Brown, age 22 years.

variance with the job for which he had been trained and the work experience he had had.

Certain practical considerations intrude at this point. It would be costly and time-consuming for this case to return to the School of Business Administration for example. Thus a short course in a commercial business college might be more advisable. A third alternative would be a job hunt for a position in the business-detail field. However, because of the scarcity of jobs and because employers look askance at an applicant who seeks a job outside his field of training and experience, this alternative was not too hopeful.

The boy's family urged him to return for a graduate degree in economics; but he refused this, rather wisely, because he wanted not the theoretical training of graduate work but the more practical training of the School of Business Administration itself.

I referred him to the Dean of the School of Business Administration to find out how long it would take him to complete the requirements for that degree. I also made him get bulletins from various commercial business colleges and asked him to return to see me.

By the last recorded interview the boy had found that he could complete the School of Business work in four school terms and one summer term. He was strongly inclined to attempt this, but he mentioned that the placement department of the Institute of Technology had put him on the trail of two other engineering jobs. He also mentioned that he was inclined to turn down both of them in favor of the return to school.

As the case now stands, the boy will be in summer school this summer; and I expect him to make even more satisfactory grades than he had made in his engineering subjects.

This case is extremely interesting from several standpoints. In the first place, if he does make higher grades in the subjects in the Business School, one will have slight support for charging that his engineering grades represented some under-achievement, even though they were at the passing level. In the second place, the low interest-maturity score was borne out in the retesting by the emergence of a clear-cut pattern which was merely foreshadowed in the slight secondary pattern at the time of original testing. In the third place, the emergence of a pattern at variance with the training ex-

perience has some bearing on the too-frequent generalization that the job determines the interests.

The next case will illustrate the converse of our hypothesis: Where interest maturity is high and where no primary or secondary patterns exist, some form of more immediate educational maladjustment may be found.

CASE OF DWIGHT SMITH

Although the keys of the *Vocational Interest Blank* cannot be shown to have a high zero-order correlation with scholastic success as measured by grades, it frequently will yield a clinical relationship in which its use leads not only to higher grades but also to increased feelings of adjustment on the part of the individual student. The following case will illustrate this.

General findings.—Dwight Smith came to the Testing Bureau in the spring quarter of his freshman year. He was planning to take a major in physics in the Institute of Technology, and his grades for the fall and winter quarters fell between a C and B average, which is more than adequate in our engineering schools.

The boy had been salutatorian in a graduating class of 115 students in a Kansas high school. The only test needed for admission to the Institute of Technology was the English-placement test given in September 1938, during Freshman Week. He stood in the top thirty-five per cent and was appropriately classified in engineering English (Fig. 42).

Both parents were foreign-born Scandinavians. An older brother was working as a chemist; a younger sister was still in high school. The boy's father was owner and manager of an automobile service station.

In spite of the fact that the boy had between a C and B average, he came to us because he was not satisfied with his school record and because he wanted to check his abilities and interests so he would not, in his words, "waste four years." He had considered the college teaching of physics, the sales and distribution phase of business, also architecture and political leadership. His reason for the latter choice is interesting: "to aid in the struggle for a peaceful, useful, equal society." He goes on to say: ". . . . on the basis of my past experience, I feel that I have superior abili-

Form 10
1937-1938

UNIVERSITY TESTING BUREAU
Summary Profile

U.T.B. Case No. 11345

Name Smith, Dwight College I.T Class Fr. Sex M Age 19

	Date	Name of test	R Score	%ile	Norm. Group
Scholastic Aptitude		H.S. Scholarship (McPherson)		99	
	6-14-39	Am. Coun. Psycho. 1936	282	96	SLA-Gen. Fr.
		Completion	42	78	
		Arithmetic	72	100	
		Art. Lang.	61	75	
		Anal	54	100	
		Opp.	63	60	
	5-27-39	Miller Angl A	83	97	Jr. Sr. in Ed
	6-13-39	Ohio Psycho. (18) Intermediate Time	85 111	75 95	SLA Fr. Ohio Fr.
Achievement Tests	9-38	Co-op. Eng. Test 1937 - Total	175	68	SLA-Gen. Fr.
		Usage	115	50	
		Spell.	15	18	
		Vocab.	45	48	
	6-13-39	Co-op. Gen. Science 1937 (Coll.)	104	93	SLA Soph.
	6-14-39	Co-op. Cult. Math. 1938	50	99	SLA Soph.
Special Aptitudes	6-13-39	Minn. Cler. Numbers	95	67 7	Gen pop. of univ
		Names	87	62 8	Gen pop. of univ
	6-13-39	McAdory Art	164	24	U Soph.
	6-15-39	Spatial Relations	817	99	Gen pop. men
	6-13-39	Chap. Cook Read. (A+B)	165	24	SLA Fr.
Personality Tests	6-13-39	Social Behavior	172	96	U Stud.
	6-13-39	Social Preferences	157	86	U Stud.
	5-23-39	Rundquist-Sletto: Morale	38	96	SLA Fr.
		Inferiority	39	99	
		Family	49	64	
		Law	68	6	
		Econ. Conservatism	63	45	
		Education	50	21	
		General Adjustment	31	79	
	5-23-39	Bell Adjustment Inv.	Home 4 Good	Health 9 Aver.	Social 3 V Agg. Emotional 4 Good Total 20 Good

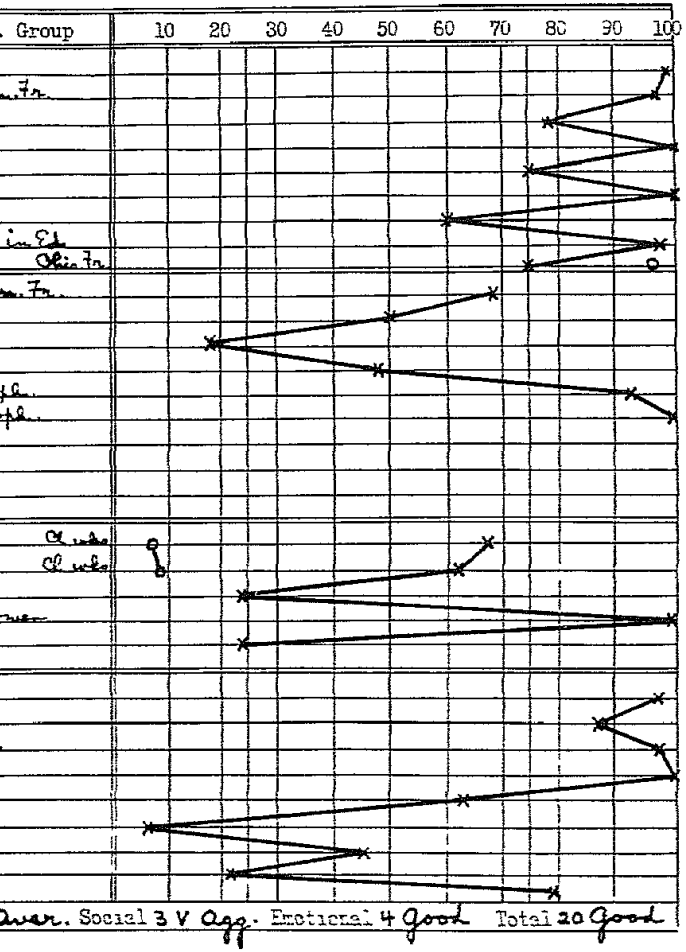


FIG. 42.—Scholastic and personality scores of Dwight Smith, age 19 years.

ties in several fields. I would like to find out what my aptitudes are and how much success I should try to attain in the fields I choose."

The test evidence is illuminating. From the standpoint of basic ability, on three separate measures, the boy is definitely better than an average risk. His potentialities for graduate work, however, remain to be checked (Fig. 42). He has a slight reading disability. He is superior to end-of-the-year liberal arts sophomores in the fields of science and mathematics, even though he is only an end-of-the-year freshman.

The evidence from the first vocational-interest test, given in June, is quite interesting. He shows no interests in technological fields but a marked interest pattern in the social-service fields and in the fields of business (Fig. 43).

Counseling.—The summer vacation interrupted the interviewing, but there was an exchange of letters that has some significance. After returning to his home in Kansas, the boy wrote me regarding the test scores. I replied that counseling could not be done by mail, but that there seemed to be some conflict between his claimed interest in engineering and other evidence from Strong's test and his own statements. I invited him to talk this over with me before he registered for his second year. His reply is quoted here in part:

> I have no definite vocational plans. My interest in business, I can see, is gradually decreasing while my interest in teaching is correspondingly increasing. If I were to become a business man, I would be compelled to set up money-making as my life's purpose. This would be in direct conflict with my present philosophy. I am eager to get your suggestions.
>
> But my immediate task is to decide what to take this fall. Courses in writing and speech I definitely want; I feel that I must have them to properly equip myself for later leadership. Courses in logic and ethics would be fascinating to me, I believe. I am now of the opinion that these subjects are taught so that the student is compelled to think, and not merely required to accept a body of facts. If my opinion is true, I would enjoy these subjects. Mathematics I like; in psychology, history, art, and music I have always been interested. Perhaps I would do well to take courses in speech, writing, logic and art this fall, but I need your help.
>
> I have told you what I think I want; I am waiting for you to tell me what I should have. May I have your advice?

He came in in September and we worked out a program to include advanced writing, political science, psychology, and logic.

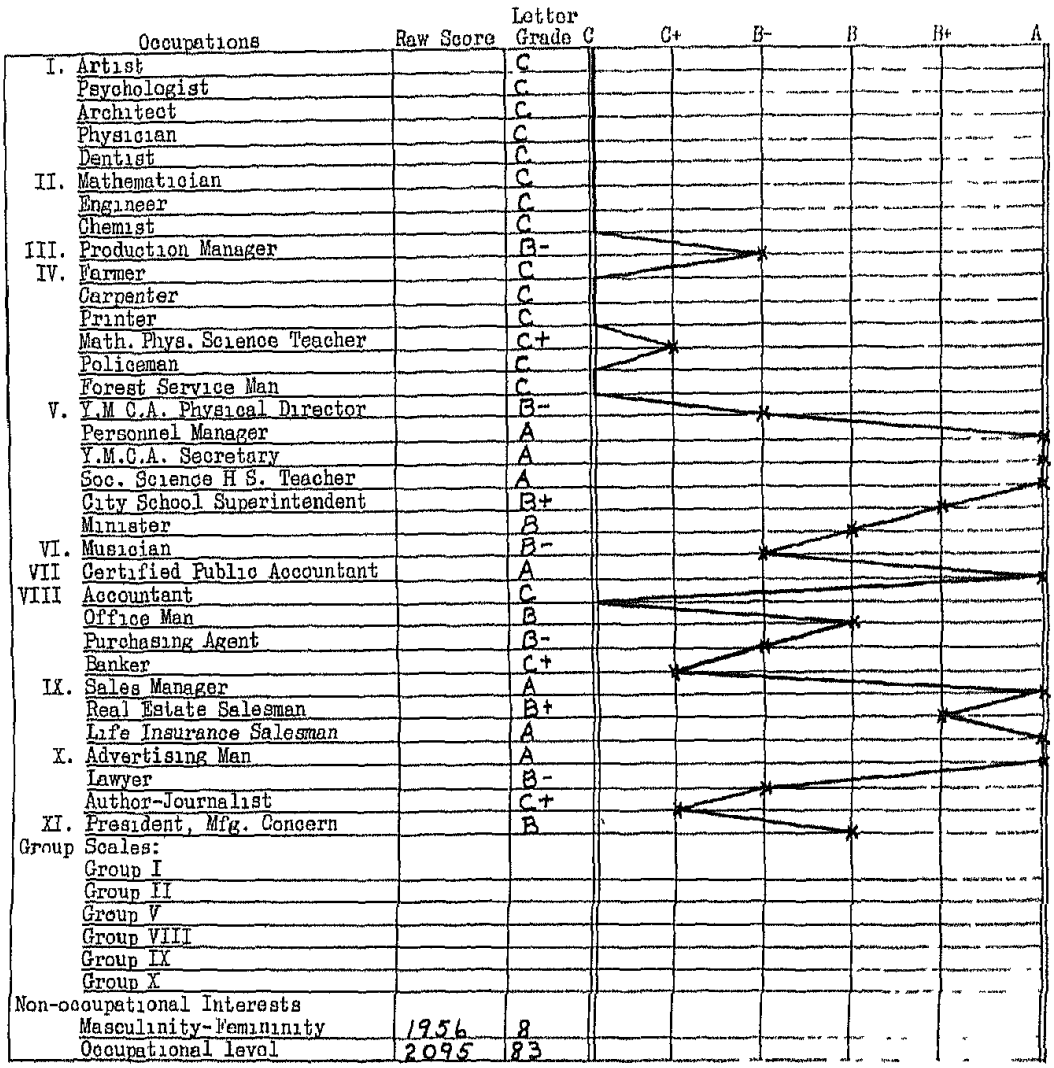
U T.B. Form 11A Case No. 11345

Name Smith, Dwight Age 19 Date 6-5-39

Person or agency forwarding for scoring UTB

SUMMARY OF RATINGS ON STRONG VOCATIONAL INTEREST BLANK - MEN

	Occupations	Raw Score	Letter Grade
I.	Artist		C
	Psychologist		C
	Architect		C
	Physician		C
	Dentist		C
II.	Mathematician		C
	Engineer		C
	Chemist		C
III.	Production Manager		B-
IV.	Farmer		C
	Carpenter		C
	Printer		C
	Math. Phys. Science Teacher		C+
	Policeman		C
	Forest Service Man		C
V.	Y.M.C.A. Physical Director		B-
	Personnel Manager		A
	Y.M.C.A. Secretary		A
	Soc. Science H S. Teacher		A
	City School Superintendent		B+
	Minister		B
VI.	Musician		B-
VII	Certified Public Accountant		A
VIII	Accountant		C
	Office Man		B
	Purchasing Agent		B-
	Banker		C+
IX.	Sales Manager		A
	Real Estate Salesman		B+
	Life Insurance Salesman		A
X.	Advertising Man		A
	Lawyer		B-
	Author-Journalist		C+
XI.	President, Mfg. Concern		B
Group	Scales:		
	Group I		
	Group II		
	Group V		
	Group VIII		
	Group IX		
	Group X		
Non-occupational Interests			
	Masculinity-Femininity	1956	8
	Occupational level	2095	83



Occupations listed by student:

1. Business Management
2. College Teaching
3. Art (Painting)
4. Architecture
5. Political Leadership

Classification of occupations.

3 Business contacts with people
Business detail work
2 Social Service activities
Special artistic abilities
Technical or scientific work
Verbal or linguistic work
1 Executive responsibilities

FIG. 43.—Interest scores of Dwight Smith, mid-term freshman year.

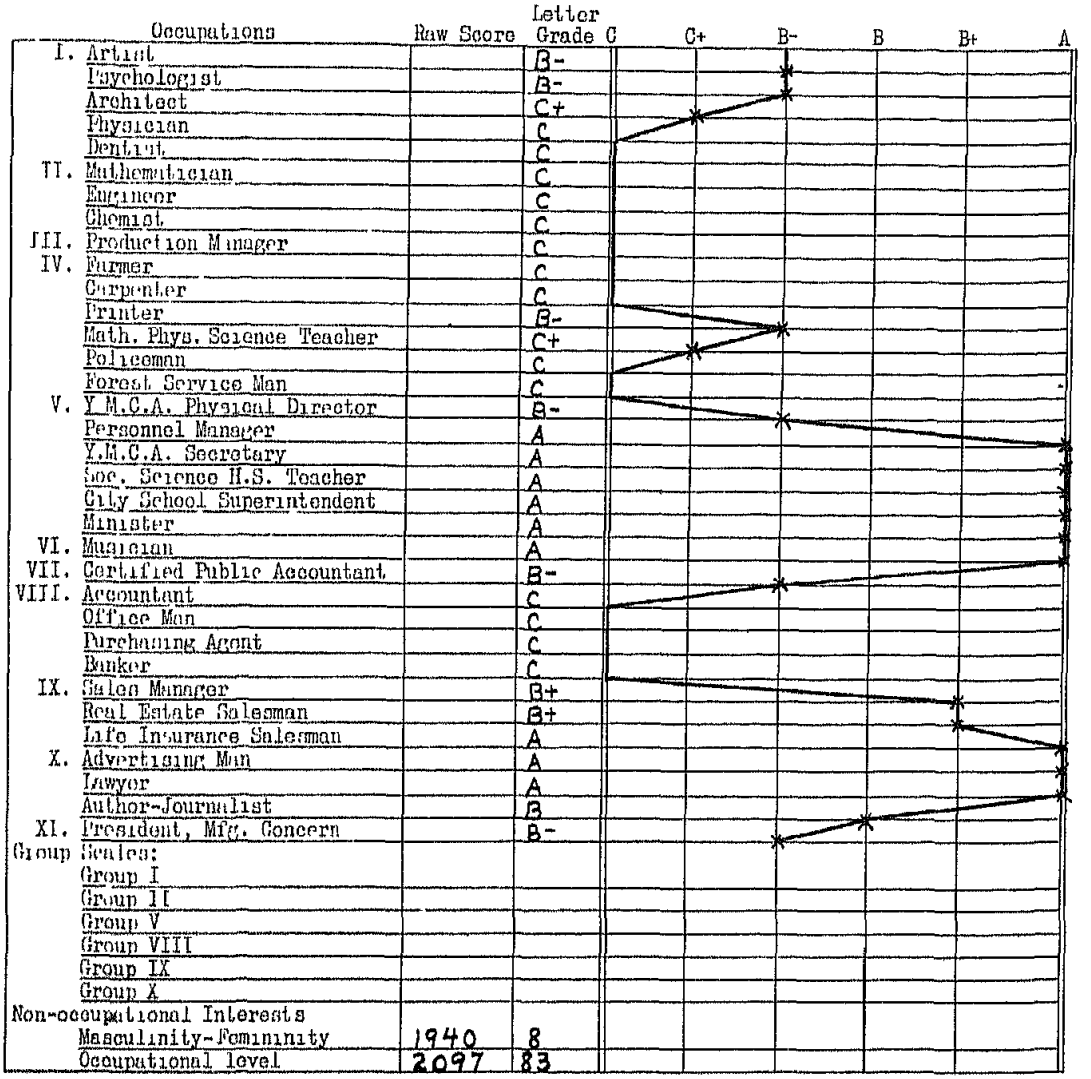
U.T.B. Form 11A

Name Smith, Dwight Age 19 Case No. 11345 Date 12-6-39

Person or agency forwarding for scoring UTB

SUMMARY OF RATINGS ON STRONG VOCATIONAL INTEREST BLANK - MEN

	Occupations	Raw Score	Letter Grade
I.	Artist		B-
	Psychologist		B-
	Architect		C+
	Physician		C
	Dentist		C
II.	Mathematician		C
	Engineer		C
	Chemist		C
III.	Production Manager		C
IV.	Farmer		C
	Carpenter		C
	Printer		B-
	Math. Phys. Science Teacher		C+
	Policeman		C
	Forest Service Man		C
V.	Y.M.C.A. Physical Director		B-
	Personnel Manager		A
	Y.M.C.A. Secretary		A
	Soc. Science H.S. Teacher		A
	City School Superintendent		A
	Minister		A
VI.	Musician		A
VII.	Certified Public Accountant		B-
VIII.	Accountant		C
	Office Man		C
	Purchasing Agent		C
	Banker		C
IX.	Sales Manager		B+
	Real Estate Salesman		B+
	Life Insurance Salesman		A
X.	Advertising Man		A
	Lawyer		A
	Author-Journalist		B
XI.	President, Mfg. Concern		B-
Group Scales:			
	Group I		
	Group II		
	Group V		
	Group VIII		
	Group IX		
	Group X		
Non-occupational Interests			
	Masculinity-Femininity	1940	8
	Occupational level	2097	83



Occupations listed by student:

1. Business Manager
2. College Teaching
3. Art (Painting)
4. Architecture
5. Political Leadership

Classification of occupations.

3 Business contacts with people
___ Business detail work
2 Social Service activities
___ Special artistic abilities
___ Technical or scientific work
___ Verbal or linguistic work
1 Executive responsibilities

FIG. 44.—Interest scores of Dwight Smith, end of freshman year.

This program would operate during the fall quarter, and I asked that he be retested on Strong's test in preparation for an interview at the end of the quarter. The retest is on the profile (Fig. 44), and it is interesting to note the slight changes. The social-service group of keys in Group V becomes more dominant. The business-detail keys drop to a C level, and the business-contact keys move slightly to a point of greater intensity.

As for his grades, for the fall and winter quarters of work they average between a B and an A in non-science subjects. In addition to the increase in grade performance, the boy's own increase in satisfaction with his program is clearly marked in the interview. As tentative plans now stand, the field of educational administration is one of the various alternatives being discussed.

Since some students of high purpose and motivation may be looked down upon by their contemporaries, we checked with the counselors in the dormitory to find that this student was popular and well-liked in spite of rather strict moral viewpoints and conscientious study habits.

Naturally his case is not closed. It illustrates a point so often overlooked in personnel work: the high-ability and high-achieving student is not thereby free from problems of vocational choice and problems of satisfying adjustment. This boy's future in this state or elsewhere will probably have in it enough of the qualities of leadership to make our time well spent in careful educational and vocational guidance.

Again, it is the *Vocational Interest Blank* that defines the broad educational and occupational fields wherein this boy's superior talents may be put to greatest advantage.

Part Five

DIFFERENTIATION OF SUPERIOR AND INFERIOR MEMBERS OF A GROUP

Members of different occupations can be differentiated on the basis of interests; so also men can be differentiated from women, 15- from 25-year-old men, and men in the upper from men in the lower socio-economic levels. Differentiation of the superior from the inferior members of the groups mentioned has not yet been accomplished to a satisfactory degree. The literature on this subject is surveyed in chapters 19 and 20, the former chapter considering successful and unsuccessful members of an occupation and the latter successful and unsuccessful students in different courses of study.

Chapter 19. Differentiation of Superior and Inferior Members of an Occupation

Many educators have long maintained that interest is an important factor in scholastic achievement. The man on the street or in the shop emphasizes interest, or willingness to work, as the most important of all factors explaining success. Can such claims be justified? If not, is it because they are not true, or is it that we have not yet learned how to measure interest?

Two different techniques for developing interest scales are involved in the discussion which follows. Scales employing the first technique represent differences in interests between (*a*) the average member of an occupation and (*b*) the average of "men-in-general." Such scales are designed to separate groups but not necessarily to differentiate superior from inferior members of such groups. Scales employing the second technique represent differences in interests between (*a*) superior individuals and (*b*) inferior individuals. Such scales should separate superior from inferior people but not necessarily one occupation from another.

When the first technique is used we should not, theoretically, expect significant correlations between occupational scores and measures of superiority-inferiority such as production, ratings, or scholarship, because the occupational scale is based on a comparison of the *average* member of the occupation with the *average* member of the men-in-general group. Seemingly the higher the occupational-interest score the more the individual should approximate the average man: there is no reason why high interest scores should mean superior men. On the other hand, high scores can quite properly mean men with sufficient interests of the right sort to like that particular occupation, and low scores can similarly mean men with insufficient interests to enjoy doing what the occupation requires. High scores should go with long-continued em-

ployment in that function (not necessarily in a particular company) and with occupational adjustment, and low scores should typify the reverse. In so far as tendency to like the work and to continue employed therein engenders good production, satisfactory ratings of superiors, or good grades from instructors, to that extent high occupational-interest scores should correlate with measures of superiority.

The second procedure is identical with that of separating men from women on the MF scale. Presumably it should be easy to separate in this way the superior from the inferior. There are, however, two real difficulties to such a program. The first difficulty is that of establishing an adequate criterion of success; the second difficulty is that of securing enough cases.

Lawyers, ministers, accountants, and so on are classified as superior, average, and inferior in everyday conversation. But when one makes a serious attempt to state in precise language what constitutes superiority or inferiority, one is confronted with a most difficult task. Even if such formulation is completed, there remains the problem of how to measure individuals in terms of the criterion and so to determine how superior or inferior they are. All of this is necessary if any kind of psychological test is to be developed with which other individuals are subsequently to be classified. The writer believes that it would be relatively easy to develop tests which would differentiate the superior and the inferior members of any occupation if an adequate criterion were available. It is precisely because such information is not available that the writer has made no real effort to measure degrees of success but has devoted his energies to measuring the interests which differentiate occupations from one another.

SECTION I

DIFFERENTIATION OF SUPERIOR AND INFERIOR EMPLOYEES ON THE BASIS OF INTEREST SCALES WHICH CONTRAST THE INTERESTS OF AN OCCUPATION WITH THE INTERESTS OF MEN IN GENERAL

The material presented here is divided into three groups, relating in turn to (1) life insurance salesmen, (2) casualty insurance salesmen, and (3) miscellaneous occupations.

OCCUPATIONAL-INTEREST SCORES VS. LIFE-INSURANCE-SALES PRODUCTION

Six sets of data regarding life insurance agents are presented. The first five sets of data are grouped together for convenience. They include data obtained from five different sources and are referred to by the letters V, W, X, Y, and Z.[1]

V.—In 1927 a medium-sized life insurance company supplied the writer with a list of all its agents who had had at least 36 months' experience and had written at least $100,000 paid-for insurance in 1926. In 1931 the paid-for production of these men for the years 1926 to 1930 inclusive was supplied. One hundred and two men continued with the company at least four of these five years, and the data given below was based upon them. They have had an average of 8.9 years of experience and have averaged annually $225,648 of paid-for production during the years 1926 to 1930 inclusive.[2] All of these men filled out the *Vocational Interest Blank* in 1927.

W.—During the five years from 1929 to 1933 the manager of a relatively small city agency required all applicants to fill out the interest test, and these blanks together with a complete record of production from date of contract to December 30, 1933, were supplied the writer. Where men had not been employed or the contract had been terminated, explanations have been supplied. All told, 46 men were considered to the extent of being asked to fill out the interest test; but only 20 were given a contract, and only 16 of these continued with the agency more than three and a half months. These 16 agents averaged 39 years of age and 43 months of experience.

X.—In 1929 a state branch of a large life insurance company supplied paid-for production data from January 1, 1926, to September 20, 1929, of all its agents, and interest-test scores for nearly all these agents. Two years later the production for 1929 and 1930 was supplied. During the year 1930 the agency discontinued all part-time contracts, thereby decreasing the size of the agency very considerably. From all these records it has been possible to use only 39 cases for this study. These were all full-time men in 1930, with at least 3 years' experience and averaging 8.6 years; but much of this experience had been accumulated on a part-time basis. The remainder had had too little experience for their production record to be accepted as significant, or they had not filled out the interest test. The 39 men averaged 47 years of age. In 1935 the manager supplied the writer with production records of his men during 1930–34, including twenty new

[1] E. K. Strong, Jr., "Interest and Sales Ability," *Personnel Journal* (1934), **13**, 204–16. Some new data are included here.

[2] Correlation between production and years of experience is .17; between life-insurance-interest score and years of experience the r is —.06.

men who had continued in business at least one year. All the new men had filled out the *Vocational Interest Blank* at the time of being employed.

Y.—In 1935 *Interest Blanks* were obtained from all the men in a small city agency in the East. Six of the men had had approximately three years' experience or more; one had had only one year's experience. Production records of the six are based on the years 1932–34.

Z.—During 1929–30, Mr. Abner Thorp, Jr., editor of the *Diamond Life Bulletins*, wrote to several hundred agency managers, on behalf of the writer, requesting that each arrange to have at least one of their former agents fill out an interest blank, so that it might be determined what was the range of life insurance scores among men who have tried the business and quit because of failure, lack of interest, or for any other cause. The returns were very disappointing. Apparently agency managers keep no record of former employees because the majority of agents who co-operated sent in blanks of men still with the agency who were rated as "failures," "unhappy in the business," "not doing as well as they should," etc. A few blanks were received of former agents and in about half of these cases a full report was made as to length of time employed, production, and type of employment entered. From all the miscellaneous data received it has been possible to use the records of 19 men who have tried the life insurance business and clearly have been unable to write sufficient business to earn a living. This group averaged 37 years of age, one year of college education, and 2.6 years' experience writing $41,000 of paid-for business annually. Eight additional cases have been included in some of our calculations. These are men reported as "unhappy," "not doing as well as they should," etc. They have had 5.0 years' experience and have averaged $126,000 paid-for business.

If the life-insurance-interest test is a significant aid in selecting applicants for the business, the following propositions should be true:

1. Successful life insurance agents score higher on the life-insurance-interest test than men in general.
2. Successful life insurance agents score higher than unsuccessful agents.
3. Men with low life-insurance-interest ratings do not earn a living in the business.
4. Men with low scores do not stay in the business, whereas men with high interest scores continue in the business, even though some leave one agency for another.

Table 121 indicates that the majority of successful life insurance agents rate A or B+ in life insurance interest. This is true

TABLE 121

LIFE-INSURANCE-INTEREST RATINGS OF CERTAIN GROUPS OF LIFE INSURANCE MEN (OLD SCALE)

Group	Number	Years of Experience	Average Annual Paid-for Production	Life-Insurance-Interest Ratings				
				Percentage C	Percentage B—	Percentage B	Percentage B+	Percentage A
Criterion group of agents	288	At least 3	$100,000 up	1	2	6	16	75
L. I. general agents[a]	204	....	....	3	1	8	15	73
Company V	108	At least 3	225,648[b]	2	2	4	15	77
Company V	102	At least 4	207,980[c]	2	2	4	15	77
Agency W, each given a contract	20	Complete record	205,000	10	0	15	35	40
Agency W, each writing $100,000 a year for at least a year	15	Complete record	258,000	7	0	13	40	40
Agency X	59	Complete record	69,000	7	3	19	29	42
Agency Y	7	Complete record, 1932–34	87,800	14	0	0	0	86
Group Z, rated as "failures," "unhappy," "not doing as well as they should," etc.	27	3.5 years	66,000	32	5	23	18	22
Group Z, rated as "failures" (included above)	19	2.6 years	41,000	35	7	30	17	11
1927 Stanford seniors, 5 years after graduation	222	....	....	73	8	12	4	3

[a] The correlation between scores on the life-insurance-agent interest scale and a scale based on the interests of these 204 managers is .91

[b] Average production based on 1926 only.

[c] Average production based on two or more years, 1926 to 1930, inclusive

not only of the criterion group of 288 insurance agents upon which the test was standardized but also of 204 general agents[a] and of the seasoned agents in Company V. Agency W does not contain as high a percentage of A men as Company V, having proportionately more B+, B, and C men. But this agency group has had far less experience (only 35 months on the average) in comparison with an average of 8.9 years' experience for Company V, which means that there has been less time in which the less efficient have become

[a] These 204 records have been included in the revised life insurance criterion group.

discouraged and so have resigned. Agency X contains still fewer A and B+ men and more C men, but its production averaged only $106,000 during 1926 to 1930 and $66,000 during 1926 to 1934.[4] The situation is largely reversed in Group Z, particularly among those rated as "failures," for here only 28 per cent rate A and B+ in contrast to 92 per cent in Company V and 42 per cent rate B— and C in contrast to 4 per cent in Company V. The data from Stanford seniors gives some idea of the proportion of high and

TABLE 122

DISTRIBUTION OF LIFE-INSURANCE-INTEREST SCORES OF SUCCESSFUL LIFE INSURANCE MEN, OF BUSINESS SCHOOL STUDENTS, AND OF COLLEGE STUDENTS IN GENERAL ON THE REVISED SCALE

(*Percentages*)

Standard Score	Successful Life Insurance Agents (315[a])	Students in Graduate School of Business (121)	Former Seniors Tested 5 Years Afterward (223)
75	.6	....	....
70	.6	....	....
65	6.3	....	....
60	9.5	1.7	.9
55	16.8	1.7	....
50	21.3	5.8	4.5
45	13.0	12.4	5.4
40	14.9	11.6	4.9
35	9.2	15.7	16.1
30	5.7	13.2	13.0
25	1.6	17.4	14.3
20	.3	11.6	16.1
15	....	4.1	11.2
10	....	4.1	8.5
5	....	.8	4.5
0	....	....	0.4
Mean	50.0	34.7	28.8

[a] Figures in parentheses indicate total number.

low life-insurance-interest ratings to be found among college graduates, and indicates that successful life insurance men are far from being a random sampling of educated men as far as life-insurance interest is concerned (see also Table 122). Evidently

[4] The effect of the depression is shown in the average production of this agency, which averaged as follows, beginning in 1926: $119,000, $131,000, $119,000, $141,000, $116,000, $73,000 (1931), $61,000, $50,000, and $62,000 (1934). The relatively poor showing of groups X and Y are attributable to the fact that their data include the years 1930 to 1934.

successful life insurance agents score higher in life-insurance interest not only than men-in-general but also than unsuccessful agents.

Table 123 indicates that men with low life-insurance-interest ratings do write too little insurance (only $62,000 per year) to

TABLE 123

AVERAGE ANNUAL PAID-FOR PRODUCTION IN RELATION TO LIFE-INSURANCE-INTEREST RATINGS (OLD SCALE)

Group	Total Number	Life-Insurance-Interest Ratings				
		C	B—	B	B+	A
Company V. At least 4 years' experience:						
Number	102	2	2	4	15	79
Production	...	$169,000	$236,000	$270,000[a]	$186,000	$209,000
Agency W. At least 4 months' experience:						
Number	15	1	0	2	6	6
Production[b]	...	$2,000	..	$135,000	$195,000	$222,000
Agency X. Total record of 9 years:						
Number	59	4	2	11	17	25
Production	...	$42,000	$67,000	$65,000	$70,000	$74,000
Agency Y. Total record of 3 years:						
Number	7	1	0	0	0	6
Production	...	$9,000	..	..	..	$101,000
Group Z. Rated "failures":						
Number	27	9	1	4	5	8
Production	...	$60,000	$45,000	$51,000	$67,000	$82,000
Total						
Number	210	16	5	21	43	124
Production	...	$62,000	$130,000	$108,000	$127,000	$169,000

[a] Influenced greatly by one case with average production of $674,000. Average of other three cases is $102,000.

[b] Production was reported in terms of actual earnings, not paid-for production. The former has been converted into the latter on the basis of $13.50 for each $1,000 policy.

earn a fair living and that there is a decided increase in average production with higher and higher ratings (disregarding the five B— cases). Men with B+ ratings earn twice as much as those with C ratings and men with A ratings earn nearly three times as much. On this basis an agency with 100 men rated A would write $169,000,000, whereas an agency with 100 men rated C would

write $62,000,000. But relatively few of the C men would continue in the business a whole year, and in order to maintain one hundred C men it would be necessary to hire at least two hundred during the year and probably more than that number.

Table 124 tells the same story but in a different way. Only 6 per cent rated C wrote over $150,000 a year, whereas 37 per

TABLE 124

PERCENTAGE OF AGENTS IN EACH LIFE-INSURANCE-INTEREST RATING WHO PRODUCE $0 TO $400,000 AND UP ANNUALLY

Average Annual Production	Number of Agents	Percentage of Agents in Each Life Insurance Rating Who Produced Indicated Amount of Paid-for Insurance				
		C	B—	B	B+	A
$0 to $49,000	38	52	33	27	22	9
$50,000 to $99,000	52	24	17	45	34	16
$100,000 to $149,000	31	18	17	14	7	19
$150,000 to $199,000	37	6	17	9	13	22
$200,000 to $399,000	47	0	17	0	20	31
$400,000 up	6	0	0	5	4	3
Total	...	100	101	100	100	100
Number	211	17	6	22	45	121

cent of B+ men and 56 per cent of A men wrote $150,000 or more. If we assume that a production of $100,000 is the minimum for earning a fair living, then 75 per cent of A men qualify, 44 per cent of B+ men, 23 per cent of B men, and 24 per cent of C men. The A man is three times more likely to succeed than the C man. If we assume that an income of about $2,000 is necessary, which is about what is earned in writing $150,000 of business, then 56 per cent of A men are successful in contrast to 6 per cent of C men!

Another measure of success is the length of time men continue in the business—men with A ratings should continue much longer than men with B— or C ratings. Our data are not adequate to demonstrate this. The records from Company V are based on those who have been in the business 36 months and who wrote at least $100,000 in 1926. Very few left the insurance business in the ensuing four years. The records from Agency X are complete for

only the men who had full-time contracts in 1930. Many part-time men had left prior to this time, but their records are too incomplete to permit conclusions. Even in the case of Agency W, where quite complete records are available, the numbers involved are too small and the factors involved too complex to warrant any conclusions. Nevertheless the writer is certain that anyone studying the large number of incomplete records, which could not be included in the tables above, would agree that a much larger proportion of men with low interest ratings drop out of the business than of men with high ratings.

After noting the evident relation between interest ratings and production in the foregoing tables it is quite a shock to find that these measures correlate only .37 in the 181 cases comprising most of our data[6] (see Table 125). What is the explanation? Careful analysis of the scatter diagrams makes clear that each distribution is foreshortened at one end or both and this applies not only to interest-test scores but also in some cases to production figures. Such a condition lowers the correlation unduly. Thus, the range of interest scores in the first group (Company V) is between —25 and 600 (with 91 per cent above 150), which is but 61 per cent of the entire range of —430 to 600. Those rated "failures" range between —169 and 407 in interest scores, which is but 56 per cent of the possible range, and at the same time they range between $0 and $200,000 production, which is but 31 per cent of the production range between $0 and the highest reported in our data, i.e., $650,000, and this amount is less than that of the best producers in the country. Were it possible to induce a random sampling of the population to do their best to make a success in the life insurance business, the relationship between their interest scores and their production should be considerably higher than a coefficient of .37.

[6] Using a personal history test and a personality test, which includes many items comparable to our interest items, Kurtz reports a correlation of .40 with production records; see A. F. Kurtz, "Recent Research in the Selection of Life Insurance Salesmen," *Journal of Applied Psychology* (1941), **25**, 14. Otis reports a correlation of .50 between the life insurance and the realtor scales combined and the selling cost of 17 salesmen who sell soap, etc., to the laundry trade; see J. L. Otis, "Procedures for the Selection of Salesmen for a Detergent Company," *Journal of Applied Psychology* (1941), **25**, 40.

TABLE 125

CORRELATION BETWEEN LIFE-INSURANCE-INTEREST SCORES AND PRODUCTION

Group	Number	Months of Experience	Range of Production (unit $100,000)	Range of Interest Scores	Percentage Production under $100,000	Percentage with C and B— Ratings	Correlation Coefficient
1. Company V	102	At least 48	37 to 650	—25 to 600	14	2	.10[a]
2. Agency W	20	1 to 87	0 to 379	—12 to 369	25	10	.20[b]
3. Agency W	16	4 to 87	1 to 379	—12 to 369	19	12	.48[c]
4. Agency W and subsequent agency record	26	1 to 89	0 to 379	—12 to 369	44	8	.33[d]
5. Agency W and subsequent agency record	22	4 to 89	1 to 379	—12 to 369	45	9	.55[e]
6. Agency X, years 1926–1930	37	At least 36	26 to 271	—187 to 348	57	16	.52
7. Agency X, years 1926–1934	59	1 up	5 to 205	—187 to 454	81	10	.20
8. Group Z, rated "failures," "unhappy," etc.	27	3 to 120	0 to 200	—169 to 407	74	37	.23
9. Group Z, rated "failures," only	19	3 to 96	0 to 85	—169 to 407	100	42	.02
Total of 1, 3, 6, and 9	181	3 up	0 to 650	—169 to 600	43	17	.37[f]

[a] The reliability of the production criterion, based on the average of 2 to 5 years, may be judged from the following correlations: 1926 production vs. 1927, .78; 1927 production vs. 1928, .77; 1928 vs. 1929, .84; 1929 vs. 1930, .74. Average of 1926 and 1927 vs. average of 1929 and 1930, .81.

[b] If one case is omitted—a man who with considerable aid from his manager sold a group policy and then resigned—the coefficient is .40.

[c] If the one case mentioned above is omitted, the coefficient is .79

[d] If the one case mentioned above is omitted, the coefficient is .50.

[e] If the one case mentioned above is omitted, the coefficient is .77.

[f] Here the exceptional case is omitted.

A second explanation of the low correlation coefficients is to be found in the fact that in only one case do we have anything like a complete record of all the men who entered an agency and their subsequent accomplishments. The correlation between interest score and production in this case (Agency W) is .20 when based on records from only this agency and .33 when records from other agencies are added so as to cover the salesman's entire insurance experience. These coefficients are raised to .48 and .55, respectively, if the records of those with less than four months' experience are excluded on the ground that such records must be very unreliable.[6] All four coefficients are raised to .40, .50, .79, and .77, respectively, if a single case is excluded which the manager emphatically claims should be disregarded. The manager states he did everything he could to help the man succeed, but to no avail. The agent was finally assigned a group policy case and although he spent several months upon it was unable to put it over. The manager finally closed the case but rewarded the agent with such a substantial portion of the commission that it gave this man one of the highest production records in the agency. As his interest score was the lowest, this record very substantially lowers the correlation when included in the calculations.

A third explanation is to be found in the fact that production, or income, is not a perfect criterion of success. One agent might sell $400,000 and have half of it lapse the next year; a second agent might sell $250,000 and have practically none of it lapse. Another agent the writer has known sold a large volume but made so many enemies he had to move from place to place every few years. There are other factors that contribute to the complete picture of the really satisfactory agent. Success is also relative as to locality—more income is a necessity in New York City than in many rural communities. Success is seemingly dependent upon factors outside the personality of the salesman. Unquestionably his manager affects the situation; to some extent his fellows in the agency influence him; the type of prospect available contributes a share. The more one contemplates all the conflicting elements

[6] One new agent may sell $10,000 to his family and quit after one month, giving him an annual production of $120,000.

involved in success the more remarkable it is that any test will correlate even .37 with a partial measure of success.

The fourth explanation of the correlation of .37 between interest scores and life insurance production is that this is as high a relationship as may actually exist. If there are as many as five other independent factors all contributing to success, then a correlation of .40 is about what should normally be expected (see page 32).

It is customary to express the efficiency of a correlation coefficient by the formula, 100 $(1 - K)$ where $K = \sqrt{1 - r^2}$. On such a basis a coefficient of .37 would permit a prediction 7.5 per cent better than if the mean performance of his group were predicted for the individual. Taylor and Russell[7] have demonstrated "that under the conditions found when tests are used for selection of employees or students, correlation coefficients within the range of .20 to .50 may represent considerably more than 2 to 13 per cent of the effectiveness of an r of unity," which percentages would be expected according to the formula. If 50 per cent of employees are considered to be successful and if only 30 per cent of applicants need be employed, using a test with validity of .37, 67 per cent of those so employed should be successful instead of the 50 per cent resulting from chance. This gives a 34 per cent increase in efficiency. This example is used here to indicate that a test with a validity correlation of only .37 may contribute considerably to effective employment.

Decker's data.[8]—The sixth set of data is supplied by Decker. Seventy life insurance salesmen filled out the *Vocational Interest Blank*, the *A-S Reaction Test*, the *Allport-Vernon Study of Values*, and the *Otis Intelligence Test*. The only test to give statistically significant different mean scores between those earning over $3,000 and those earning an income under $2,000 was the interest test. The relationships between interest ratings and mean income are given in Table 126.

[7] H. C. Taylor and J. T. Russell, "The Relationship of Validity Coefficients to the Practical Effectiveness of Tests in Selection: Discussion and Tables," *Journal of Applied Psychology* (1939), **23**, 565–78.

[8] C. E. Decker, "An Experiment in the Use of Psychological Tests in the Selection of Life Insurance Agents" (unpublished Master's thesis, Dartmouth College, 1931).

TABLE 126

RELATION OF LIFE-INSURANCE-INTEREST RATINGS (OLD SCALE) TO INCOME CALCULATED FROM DECKER'S RAW DATA CONCERNING 69 SALESMEN

Rating on Life-Insurance-Interest Scale	$1,499 and Below (N = 7)	$1,500 to $1,999 (N = 13)	$2,000 to $2,999 (N = 20)	$3,000 and Up (N = 37)
A	31%	29%	50%	68%
B+	8%	43%	50%	13%
B	31%	14%	....	11%
B—	15%	14%	....	....
C	15%	....	....	8%
Mean Interest Score...	113	203	254	264

Insurance scale based on $200,000 production.—The old life insurance scale was based upon the records of 209 men who had written at least $100,000 of business in each of three years. A second scale was developed from the records of 123 men who had written at least $200,000 a year for three years. (Twenty-six of these records were new; the remaining 97 belonged to the 209 group.) When the blanks of the 209 men were scored on the second scale, the data in Table 127 resulted. The $300,000-and-up agents with a median score of 406.0 were significantly superior to the $100,000-to-$200,000 agents with a median score of 257.1 (critical ratio of 5.1) and were superior, but not statistically significant, to the $200,000-to-$300,000 agents (critical ratio of 2.3). These data suggest that it would be possible to develop a series of scales based upon differing amounts of production which would differentiate men in terms of amount of business written. But it must be borne in mind that the differentiation of the first group in Table 127 and the third group is caused to some extent at least by the

TABLE 127

MEDIAN SCORES AND RATINGS OF $200,000 LIFE INSURANCE SCALE

N	Production	Ratings						
		Median	Q	A	B+	B	B—	C
57	$300,000 and up.....	406.0	92.3	86	12	2	0	0
40	$200,000 to $300,000.....	300.0	132.5	81	12	5	2	0
112	$100,000 to $200,000.....	257.1	104.0	67	21	10	2	0
209	$100,000 and up.....	302.7	121.8	75	17	7	1	0

fact that the former constitute the larger proportion of the criterion group of this scale and that the latter are not members of the criterion group. This consideration does not apply, on the other hand, to the fairly good differentiation between the $300,000-and-up men and the $200,000-to-$300,000 men.

No such differentiation of the three groups is secured when they are scored on the old life insurance scale (see Table 128).

TABLE 128

MEDIAN SCORES AND RATINGS ON THE OLD LIFE INSURANCE SCALE ($100,000)

N	Production	Ratings						
		Median	Q	A	B+	B	B−	C
57	$300,000 and up	344.3	92.5	79	16	5	0	0
39	$200,000 to $300,000	330.0	126.7	64	26	5	3	2
112	$100,000 to $200,000	312.7	77.0	77	11	8	3	1
208	$100,000 and up	318.7	88.0	79	11	7	2	1

The difference in median scores of the best and the poorest producers in the table is 31.6, which is not statistically significant (critical ratio of 1.2).

There is need for further research here, first, because scales based on $200,000 and $300,000 production might prove to be more significant than the present scale based upon $100,000-and-upward production, and, second, because comparison between such scales and production records might throw additional light upon the relationship between interest and ability.[9]

SELECTION OF CASUALTY SALESMEN BY BILLS

Since 1932 the Aetna Casualty and Surety Company has conducted each year seven five-weeks' schools for commissioned casualty salesmen. Since January 1933 these salesmen have been tested with the *Vocational Interest Blank*, the *Bernreuter Personality Inventory*, and a self-rating blank by A. W. Kornhauser.

Bills[10] writes: "We found that the most valuable of these tests

[9] In view of this fact the revised life insurance scale was so constructed that records of men with $200,000-and-upward production were weighted twice.

[10] M. A. Bills and L. W. Ward, "Testing Salesmen of Casualty Insurance," *Personnel Journal* (1936), **15**, 55–58; M. A. Bills, "Relation of Scores in Strong's Interest Analysis Blanks to Success in Selling Casualty Insurance," *Journal of Applied Psychology* (1938), **22**, 97–104; and M. A. Bills, "Selection of Casualty and Life Insurance Agents," *Journal of Applied Psychology* (1941), **25**, 6–10.

in predicting success was the interest analysis." After considerable investigation it was found that scores on the two scales—life insurance and real estate—gave the best prediction and that no gain resulted from including the vacuum-cleaner-salesman scale. Ratings on the two scales were expressed numerically as follows: A, 3; B+, 2; B, 0; B—, —2; and C, —3. Combining the ratings of the two scales gave a range from 6 to —6.

The 588 casualty salesmen included in the one-to-five-year follow-up were rated by their managers after at least one year of employment as (1) outstanding successes (OSS); (2) successes (S); (3) Fair, will probably remain in business (F+); (4) Poor, will probably leave the business very shortly (F—); and (5) Failure, already out of the business (0). In order to secure larger populations in the subgroups only three classifications are reported upon, namely (*a*) OSS—outstanding successes, (*b*) S—successes and fair, and (*c*) F—, failures and probable failures.

The distribution of managers' ratings and interest scores are given in Table 129. For all ages "there is about three and one-half

TABLE 129

PERCENTAGE SCORES IN INTEREST ANALYSIS VS. MANAGERS' RATINGS OF 588 CASUALTY SALESMEN (AFTER BILLS)

(*Figures are percentages*)

Ratings by Managers	Scores in Interest Analysis				
	+6	+4 +5	+3 —2	—3 —5	—6
OSS—outstanding success	25	16	11	8	4
S—success	53	56	47	39	20
F—failure	22	28	42	53	76
Total number	139	130	193	71	55

times the chance of failure for the low score group as for the high"[11] (76 versus 22 per cent). There are five and one-half times as many outstanding successes among ages 25–29 who scored +6 as for those receiving the low score of —3 to —6 (33 versus 6 per cent). For ages 30 and above, the ratio is four to one. "One item of interest is that of the 19 who were under 25 years of age and who

[11] M. A. Bills, 1938, *op. cit.*, p. 100.

scored minus 6 there were 17 failures and 2 probable failures."[12]

Bills comments further:

Two items other than those given, made us feel that the data have definite meaning. The first is the internal consistency of the data almost without exception. The lowering of [interest] scores lowers the percentage of both outstanding successes and successes and increases the percentage of failures. The second item is more vague than this, but comes from having read the memoranda concerning the various individuals that fall out of line with the test. For example, one of the two outstanding successes who had a score of minus 6 was a man whose chief interest has always been engineering and whose father-in-law bought him an agency in order to have his daughter near home. The man is making an outstanding success of it but, at the last report, without enthusiasm for the work. Several of those who scored high but were failures are reported as having too much money and not needing to work.

The Aetna Casualty and Surety School group was an ideal group upon which to experiment since the situation is very much that which one gets in all selection; that is, a pre-selection by the managers or Home Office representatives previous to the giving of the test material. While this makes differentiation more difficult for the test it does duplicate the conditions under which tests can be most useful; that is, where they are used as an aid to a careful selection by interview and reference.[13]

Conclusion.—In terms of the four propositions on page 388, we may conclude that the men who are employed in selling life insurance are not a random selection but are drawn for the most part from a relatively small subsample of the general population (see Table 122); in other words, successful life insurance agents score higher on the life-insurance-interest test than men in general. Second, the successful agent scores higher than the unsuccessful. Third, men with low insurance-interest ratings do not earn a living thereby and, fourth, do not stay in the business, in contrast to the men with high ratings. In addition, on the average the greater the production, or income, the higher the life-insurance-interest score. Enough individual exceptions to this exist so that correlations between production and interest scores approximate .40. Employment of men with life insurance ratings of only A and B+ will materially reduce the percentage of agents of low production but will involve the elimination of some successful men.[14]

[12] M. A. Bills, 1938, *op. cit.*, p. 102.

[13] *Ibid.*, pp. 103–4.

[14] The evidence so far published indicates that these conclusions do not apply to industrial insurance men of the Metropolitan Life Insurance Company. These men

OCCUPATIONAL-INTEREST SCORES VS. OTHER MEASURES OF EMPLOYEE SUPERIORITY

Because occupational-interest scales were not designed to measure degrees of superiority, little attention has been given by the writer to correlating the two, except in the case of the life insurance scale. Other studies should be made in this field. A few such are recorded here.

Success expressed by ratings of superiors.—1. Advertising men: Thirty-six members of an advertising agency were rated as to their "account executive" standing by three officials of the agency, using 2 to mean "Yes," 1 to mean "Not sure," and 0 to mean "No." The results were

Rated A by interest test.....rated on average 1.69
Rated B by interest test.....rated on average 1.26
Rated C by interest test.....rated on average 0.43

Only 3 of the 17 men rated A by the test were judged as low as 1.0 by the 3 judges, whereas all the men rated C by the test were judged 0.7 or 0.3.[15] Expressed in still another way we have:

Ratings by 3 Judges	Ratings on the Advertising Man Interest Scale		
	A	B	C
2.0	73 per cent	27 per cent	0 per cent
1.7	71 per cent	29 per cent	0 per cent
1.3	50 per cent	50 per cent	0 per cent
1.0	27 per cent	73 per cent	0 per cent
0.7	0 per cent	67 per cent	33 per cent
0.3	0 per cent	0 per cent	100 per cent

are considered to be different in type from life insurance agents selling policies of $1,000 and upward. In terms of the *Vocational Interest Blank* they have much more the interests of vacuum-cleaner salesmen and office workers than of life insurance agents. See P. S. Achilles and R. S. Schultz, "Characteristics of Life Insurance Salesmen," *Personnel Journal* (1934), **12**, 260–63; R. S. Schultz, "Test Selected Salesmen Are Successful," *Personnel Journal* (1935), **14**, 139–42; and R. S. Schultz, "Standardized Tests and Statistical Procedures in Selection of Life Insurance Sales Personnel," *Journal of Applied Psychology* (1936), **20**, 553–66.

[15] E. K. Strong, Jr., "Differentiation of Certified Public Accountants from Other Occupational Groups," *Journal of Educational Psychology* (1927), **18**, 229–30.

2. Engineers: In the construction of the engineer scale 60 per cent of the blanks were from full members of the four engineering societies, 24 per cent from associate members, and 16 per cent from "outstanding men," selected by Dean T. J. Hoover of the Stanford University Engineering School. On the whole, the "outstanding men" secured higher scores, and the associate members lower scores, than full members, when the members of the four societies of civil, electrical, mechanical, and mining engineers are scored on their respective scales. There are two exceptions: full members score higher than *outstanding men* among civil engineers, and associate members score a trifle higher than full members among electrical engineers. The fact that the "outstanding men" rate higher than associate members is significant, since the former contributed somewhat less to the establishment of the scale and the norms than the latter.[16]

3. Teachers: Ullman[17] and Phillips[18] found no significant relationship between interest scores and ratings of teachers for successful performance. The latter used only occupational-interest items in his research.

4. Psychologists: Thirty-one psychologists starred in the first five editions of *Men of Science* average 48.7 on the psychology scale. The slightly lower than average score of these supposedly superior psychologists is to be explained not on the basis of superiority-inferiority apparently but on the basis of pure versus applied interest. Eight of the thirty-one men are animal and applied psychologists, scoring below 45; of two who score below 30 both have resigned teaching positions and are now engaged in business. Of the 23 scoring above 45, two have done outstanding work in animal psychology but both are well recognized as having contributed to other phases of psychology. If all ten are excluded, the remaining 21 starred men have a mean score of 53.

5. Foremen: Fifty-nine of the supervisory staff of a large in-

[16] E. K. Strong, Jr., "Interests of Engineers," *The Personnel Journal* (1929), 7, 449–50.

[17] R. R. Ullman, "The Prognostic Value of Certain Factors Related to Teaching Success" (unpublished Doctoral dissertation, University of Michigan, 1930).

[18] W. S. Phillips, "An Analysis of Certain Characteristics of Active and Prospective Teachers" (unpublished Doctoral dissertation, George Peabody College for Teachers, 1935).

dustrial concern were rated with far more than ordinary care. The correlations between ratings and occupational scores follow:

	Correlation
Ratings vs. chemist	.341
Ratings vs. engineer	.307
Ratings vs. certified public accountant score	.253
Ratings vs. teacher	.139
Ratings vs. personnel manager	.134
Ratings vs. accountant	.034
Ratings vs. lawyer	.009
Ratings vs. life insurance salesman	−.308

Although these correlations are low, the positive ones describe fairly accurately the characteristics of a foreman or chemical engineer in a chemical plant; it is, however, not at all clear why the ratings of such men should correlate higher with their scores on the C.P.A. scale than on the accountant scale.

6. Forty-four janitor-engineers rated above average in their work averaged higher on seven occupational scales than 23 janitor-engineers rated below average (see Table 130). All these scales

TABLE 130

MEAN STANDARD SCORES MADE BY BOARD OF EDUCATION JANITOR-ENGINEERS WHO WERE RATED ABOVE AND BELOW AVERAGE*

(After Berman, Darley, and Paterson)

Occupational Scale	44 Men Above Average	23 Men Below Average
Chemist	57	51
Physicist	56	52
Mathematician	54	52
Engineer	59	50
Architect	53	51
Physician	57	53
Farmer	55	52
Average	55.9	51.6

* Standard scores used here were developed by Berman, Darley, and Paterson, and pertain to old scales.

fall in Occupational Groups I, II, and IV; scales in the remaining groups did not differentiate the two classes of janitors (Group III was not used). "It is evident that interests in technical pursuits characterize the better workers on this job. This does not need to

be interpreted as a direct causal factor; but it is undoubtedly a conditional factor in differentiating workers within an occupational group."[19]

7. Policemen from Duluth, Minnesota, are included in the criterion group for that occupation. They were divided into three groups according to the ratings assigned them by the captain. "Since all 123 are employed, the ratings presumably cover a relatively small range between the best and poorest man." "Groups rated A and B are in every case more interested than the group rated C in occupations involving social contacts, whereas the lowest efficiency group tends to be undifferentiated from people in general with respect to such interests. Thus there is evidence of a conditional relationship between interest trends or patterns and vocational success among policemen as well as among janitor-engineers. Possibly interest trends, rather than specific occupational interests, provide a broader basis for interpretation of the data."[20]

Success expressed by Employment vs. Unemployment.—What the exact relationship is between employment-unemployment and efficiency is not known: but since 1929 one is quite prone to consider any employed man as successful.

Comparison of occupational-interest scores of employed and unemployed accountants, bookkeepers, office clerks, carpenters, and machine operatives disclosed no significant differences. But such differences were discernible in the field of retail sales—"the average employed retail salesman is more interested in commercial occupations than people in general and than unemployed retail salesmen; conversely, he is less interested in technical pursuits than people in general and than unemployed retail salesmen."[21]

Success indicated by occupational adjustment.—Occupational adjustment was viewed by Berman, Darley, and Paterson[22] as "relatively independent of employment status." Individual diag-

[19] I. R. Berman, J. G. Darley, and D. G. Paterson, "Vocational Interest Scales," *Employment Stabilization Research Institute* (University of Minnesota Press, 1934), Vol. 3, No. 5, pp. 17–18.

[20] *Ibid.*, p. 18.

[21] *Ibid.*, pp. 15–16.

[22] *Ibid.*, pp. 16–17.

nosis of both employed and unemployed employees was made on the following basis:

I. Adjusted if the modal or last occupation was in line with abilities, interests, and background.

II. Nonadjusted
   A. Unadjusted, if there was no modal occupation, although sufficient time had elapsed in the work history.
   B. Maladjusted, if the modal or last occupation was not in line with abilities, interests, and background.
   C. Exploring, if there was insufficient work experience upon which to judge appropriateness of choice.
   D. Unclassified, if there was insufficient evidence upon which to make a decision.

Adjusted, employed salesmen averaged 58.7 standard score on their sales occupations; adjusted, unemployed, 53.0; unadjusted, employed, 54.3; and nonadjusted, unemployed, 50.7. Much the same conclusion can be drawn respecting clerical workers except for the one group of 26 unadjusted, unemployed men who averaged almost as high as the adjusted, employed men. Because of this exception it is best to wait until further data are available before attempting any conclusion regarding the relationship between occupational-interest scores and occupational adjustment as measured by unemployment.

Success measured by mechanical abilities tests.[23]—Hubbard employed as a criterion the objective scores assigned 100 seventh-grade boys by a research staff who had made an extensive study of mechanical abilities.[24] She devised an interest scale applicable to her *Interest Analysis Blank for Boys* so that the scores should differentiate between the boys who scored high and low on the objective mechanical-ability scores. The correlation of .66, obtained between the criterion and the interest scores of these boys, measured the success attained by Hubbard in relating mechanical interests to mechanical abilities. Second, she correlated interest scores with the scores on five mechanical ability tests, obtaining coefficients ranging between .09 and .46, and the final coefficient

[23] R. M. Hubbard, "A Measurement of Mechanical Interest," *Pedagogical Seminary and Journal of Genetic Psychology* (1928), **35**, 229–52.

[24] See D. G. Paterson, R. M. Elliott, L. D. Anderson, H. A. Toops, and E. Heidbreder, *Minnesota Mechanical Ability Tests* (University of Minnesota Press, 1930).

of .57 with three of these tests combined. Data on new groups of boys gave correlations ranging from —.11 to .33 (averaging .20) with the five mechanical tests, and ranging from .00 to .35 (averaging .22) with the battery of three tests. According to Hubbard the correlations show a " 'slight relationship' between mechanical interest and mechanical ability as measured by this battery."[25] "Interests and abilities seem to be independent variables, each one contributing its own quota to ultimate success."[26] She adds:

> Interests, however, do contribute to the prediction of mechanical success as measured by shop ability, when they are combined with suitable mechanical tests. They add something to the value of the prediction possible on the basis of tests alone.[27]

Hubbard's extensive investigation certainly suggests the foregoing conclusions. But the criterion group for development of her scale was small, including only 100 boys, and none of the mechanical-ability tests, although probably as good as there are, are anywhere near perfect measures of mechanical ability. The writer would like to see what would happen if a mechanical-interest scale based upon 500 mechanically superior and 500 mechanically inferior boys was used in an investigation of this sort.

SECTION II

DIFFERENTIATION OF SUPERIOR AND INFERIOR EMPLOYEES ON THE BASIS OF INTEREST SCALES WHICH CONTRAST THE INTERESTS OF THE SUPERIOR AND THE INFERIOR MEMBERS OF AN OCCUPATION

In this and the next section interest scales are utilized in which the interests of the superior are contrasted with those of the inferior. Here we should expect definite relationship between interest scores and measures of efficiency. Unfortunately only a few such scales have been attempted. In the first two cases the unsatisfactory results may very well be attributed to the very small samples employed.

Ream's superiority-inferiority scale of life insurance salesmen.—Ream[28] was the first to contrast the interests of the superior and the inferior members of a group. Unfortunately his superior

[25] R. M. Hubbard, *op. cit.*, p. 239.

[26] *Ibid.*, p. 249.

[27] *Ibid.*, p. 251.

[28] M. J. Ream, *Ability to Sell* (Williams & Wilkins, 1924); see also p. 605.

and inferior members were selected from students in a nine weeks' training school for life insurance salesmen where the opportunities to sell were quite restricted and the members included in his criterion groups were very small (less than thirty). Under these circumstances it is not surprising that he failed to differentiate the superior and the inferior salesmen.[29]

Selection of retail salespeople by Craig.—Craig[30] gave an extensive battery of 26 tests to 25 good and 25 poor saleswomen at the Kaufmann Department Store in Pittsburgh. "The tests of ability all failed to distinguish good and poor saleswomen." Certain questions dealing with one's preferences were answered sufficiently differently by the good and poor saleswomen to differentiate the two groups to the extent of 89 per cent. A second experiment was conducted at the Macy Department Store in New York City. More or less new items when properly weighted from the replies of 25 good and 13 poor saleswomen gave a correlation of .76 with successful salesmanship. But this new scoring procedure failed to distinguish between the good and poor Kaufmann saleswomen and the method developed at Kaufmann's was unsuccessful with the Macy saleswomen. Finally the second scoring system was tried out upon a new group of 71 saleswomen: here the correlation with sales records was .03. Further experimentation led to the conclusion that the sales criterion at Macy's was fairly satisfactory but that the reliability of the test items was quite unsatisfactory.

Craig enumerates three hypotheses as to why the investigation failed. First, the characteristics which differentiate good saleswomen from poor ones are independent of preferences and interests. Second, good saleswomen cannot sell everything. In other words, retail saleswomen can be studied successfully only when they are divided into subgroups on the basis of the commodities they sell. Third, saleswomen will not give thoughtful and honest answers but rather the answers they feel they ought to give.[31] It is

[29] Freyd similarly failed to differentiate superior stock salesmen from average salesmen and failures among a total of 31 salesmen; see M. Freyd, "Selection of Promotion Salesmen," *Journal of Personnel Research* (1926), **5**, 142–56.

[30] D. R. Craig, "The Preference-Interest Questionnaire in Selecting Retail Saleswomen," *Journal of Personnel Research* (1925), **3**, 366–74.

[31] The validity of these hypotheses remains to be established. The writer is very

interesting to note that Craig had no suspicion that his investigation might have failed because his scoring procedure was based upon so few cases.

Differentiation of successful and unsuccessful aviators. A success-failure aviation scale was constructed by contrasting the interests of 510 successful aviators and 173 "failures." The success criterion group was used originally as the criterion group for the aviation-interest scale. It is an outstanding group of commercial and service pilots with 4 to 25 years of experience (mean is 10.6 years) and with a record of having flown 1,000 to 12,000 hours (mean is 3,724 hours). The "failure" group is composed of 65 naval trainees and 32 Civilian Aeronautics Authority trainees who failed their preliminary course and 76 men rated the "poorest in my section." The first subgroup was supplied by the late Commander Eric Liljencrantz of the United States Navy. The third subgroup was secured by Dr. E. L. Kelly. Although the members of this subgroup were rated "poorest," they did not necessarily fail. It is for this reason that the whole group is referred to as "failure" with quotes about the word. These 173 cases represent all that could be secured after several months' work. Once a man has failed the organization has no interest in him and the writer has repeatedly found it practically impossible to obtain his record. In this case hundreds of blanks were filled out in advance but subsequent records have come in very slowly.

The regular aviation-interest scale does differentiate men volunteering for aviation extremely well from those not found in such classes. In fact very few cases have been found by us in primary-training centers with low scores on this scale. It is possible that fear of consequences by the man and his family deters those with slight interest so that only those with considerable interest volunteer and such men have sufficient aviation interest to pass the test. On the other hand, the aviation interest scale does not differentiate the successes from the failures among those in training, as is shown in the left-hand half of Table 131.

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strongly of the opinion that the second hypothesis is true and that selection of retail salespeople, as well as other types of salesmen, must be based upon the commodities sold.

TABLE 131

SCORES OF SUCCESSES AND "FAILURES" AMONG AVIATORS ON (1) AVIATION-INTEREST SCALE AND (2) SUCCESS-FAILURE AVIATION-INTEREST SCALE

Groups	Aviation Interest Score		Success-Failure Aviation Interest Score		
	Mean Score		Mean Score		Critical Ratio of Difference
	Raw	Standard	Raw	σ	
25 Successes (Primary Group)	112	50.2	82	..	...
25 "Failures" (Primary Group)	81	43.8	—5	..	...
106 Successes (New Cases)	110	50.0	30	44	1.1
17 Failures (New Cases)	103	48.3	15	51	

The success-failure scale definitely differentiates 25 successes and 25 "failures," both members of the two criterion groups upon which the scale is based (see the right-hand half of the table). But the scale does not differentiate to any marked degree two new groups of successes and failures (critical ratio of difference of the two mean scores is only 1.1). The success obtained in the first comparison and the failure in the second comparison are characteristic of scales based on too-small criterion groups.

The ineffectiveness of the success-failure scale may be attributed to one or more of the following reasons: first, the "failure" criterion group is too small; second, it is composed of too many questionable failures to necessarily represent that category; third, it is entirely possible that successes and failures within some occupations cannot be differentiated in terms of interests. Before considering the evidence of Ryan and Johnson that such differentiation is possible in two cases let us consider the relationships that may exist between the two types of scales.

The relationship between an occupational-interest scale and a success-failure scale for that occupation is illustrated in Figure 45. The former scale may be indicated by the line *MG–O*, which connects the centers of two spheres typifying the men-in-general group and the occupational group. (Presumably the two spheres should overlap, but that question is not germane to the discussion and need not concern us here.) The success-failure scale may be similarly illustrated by the line *S–F* where *S* is the center of a portion of the sphere *O* and *F* is the center of a population adjacent to that

sphere. The success population is pictured as a portion of the occupation, whereas the failure population is shown outside the sphere but closely adjacent to it. (It is immaterial to the argument whether or not these two populations are properly drawn so long as it is true that they are located on opposite sides of the entire occupational distribution.)

The point we wish to make is that if the relationship of the success-failure scale to the occupational-interest scale is as shown in the upper diagram of the figure, then the correlation between

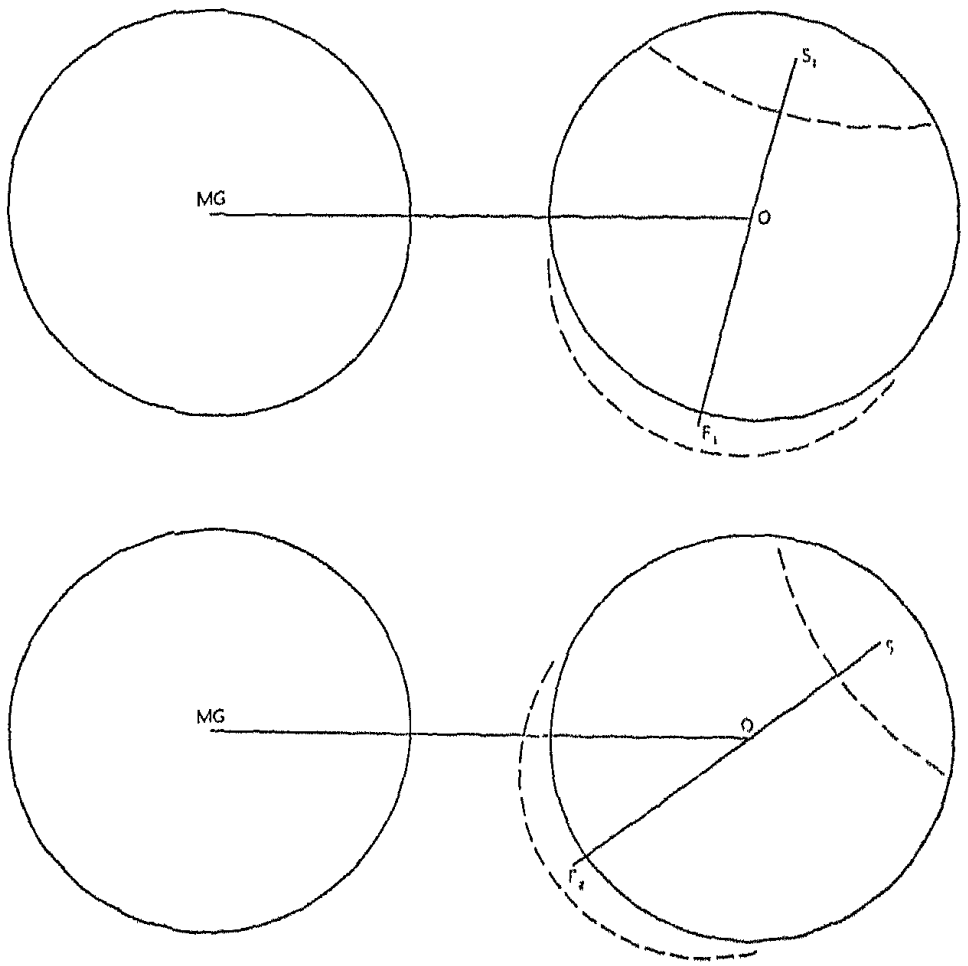


FIG. 45.—Showing the relationship between an occupational scale, which contrasts the interests of men in general (MG) and the occupation (O), and a success-failure scale, which contrasts the interests of successes (S) and failures (F).

scores on the two scales should be low. But if the relationship between the scores on two such scales is as shown in the lower diagram, then the correlation should be fairly high. The former may typify the situation with the two aviation scales,[32] which correlate about .25; the latter might typify two such scales for life insurance salesmen since there is a correlation of .40 between scores on the occupational scale and success in selling.

The two diagrams indicate that the relationship between an occupational-interest scale and a success-failure scale may vary greatly from occupation to occupation.

Ryan and Johnson[33] constructed occupational interest scales for (*a*) salesmen selling machine equipment for accounting purposes and (*b*) servicemen who inspect, repair, and generally maintain such equipment. They also developed scales for these two groups in which the interests of the superior and inferior members were contrasted. In the case of the salesmen the scale contrasting the interests of the salesmen with men in general differentiated the salesmen from men in other occupations but did not differentiate the superior and inferior salesmen all of whom had had three years' experience. The superior-inferior scale based on 62 superior and 32 inferior salesmen gave statistically significant differences in mean scores not only between the two primary goups but also between the two control groups of 24 and 25 cases, respectively. In the case of the servicemen where more cases were available there was again no differentiation between the superior and inferior men on the regular scale, whereas the superior-inferior scale gave mean scores for the two control groups of 37.4 and 19.2, respectively, the difference having a critical ratio of 4.8. The general drift of all their data suggests that, when still larger samples are available, fairly good differentiation may be obtained between superior and inferior employees "already carefully selected according to traditional methods."

[32] The line O–F_1 actually represents the success-failure aviation scale, as the successes are equivalent to the occupational criterion group. But typically successes, or better expressed, "outstanding successes," will constitute only a portion of the whole occupation.

[33] T. A. Ryan and B. R. Johnson, "Interest Scores in the Selection of Salesmen and Servicemen: Occupational *vs.* Ability-Group Scoring Keys," *Journal of Applied Psychology*, 1942, **26**, 543–62.

CONCLUSION

So far relatively little attention has been given to differentiating superior and inferior members of an occupation on the basis of their interests. The failure of Ream, Freyd, and Craig to develop such interest scales has undoubtedly caused others to consider such procedures futile. Possibly, now that it is realized their failures were caused at least in part by the use of far too few cases, others may try out the possibilities of this method of differentiating superior and inferior members of a group.

As previously pointed out there are two practical difficulties in this procedure. There is first the necessity of establishing an objective criterion as to superiority-inferiority by which individuals may be measured. And, second, there is the necessity of employing 250 to 500 examples of the two extremes—not an easy thing to do. The writer attempted to establish such a scale for high-school teachers only to find that the principals of most of the high schools of California could report only 62 unsatisfactory teachers!

The existing occupational-interest scales were not designed to differentiate the superior and the inferior members of an occupation but to differentiate one occupation from another. The evidence given in Section One of this chapter indicates that such scales actually differentiate the superior from the inferior to a greater degree than might be expected at first thought. There are three reasons which may account for this: First, interests correlate with abilities. Evidence for this is not yet available. Second, an occupational-interest scale in contrasting the interests of successful members of an occupation with the interests of men-in-general must approximate to some degree a scale contrasting the interests of superior and inferior members. The successful and the superior differ only in degree, and the average of men not in the occupation and the inferior in the occupation must have some points in common. Third, those with interests characteristic of an occupation should like that occupational environment and those without such interests should not enjoy doing what the occupation requires. Consequently, scores on an occupational-interest scale might correlate not with measures of ability but with measures of adjustment to varied aspects of the occupational environment. In this

third case the interest scores would foretell occupational turnover rather than superiority-inferiority. It seems evident to the writer that this third factor plays an important role—that correlations between interest scores and any measure of efficiency are most significant when the employee's record is measured over a long period of time. When months or, better, years are involved, the inefficient are weeded out not only because they can't do the work but because they don't want to. They don't want to because they don't like that environment.

Chapter 20. Differentiation of Superior and Inferior Students

What is the relationship between interests and scholastic achievement? Can superior students be differentiated from inferior ones on the basis of interest?

Five different procedures have been employed in investigations of the subject. They utilize five different measuring sticks in expressing the interests of students, as follows:

I. Student's expressed choice for (*a*) the school subject he likes best and (*b*) the occupation he expects to enter.

II. Occupational-interest scales, designed to differentiate between occupations.

III. Interest scales designed to differentiate between courses of study.

IV. Interest scales designed to differentiate superior and inferior students in general.

V. Interest scales designed to differentiate superior and inferior students in one school subject.

I. THE RELATIONSHIP BETWEEN STUDENT'S EXPRESSED CHOICE AND SCHOLASTIC ACHIEVEMENT

Expressed choice has been made with regard to (*a*) preferred school subject and (*b*) the occupation which one expects to enter.

Relationship of preferred school subject to scholastic achievement.—What is the significance of the statement by a student, "I want to study this course. I don't like that course"? Do they obtain better grades in courses they like than in courses they dislike?

The early studies of Thorndike[1] utilized data based on *memory*

[1] E. L. Thorndike, "The Permanence of Interests and Their Relation to Abilities," *Popular Science Monthly* (1912), **81**, 449-56; also his "Early Interests: Their Permanence and Relation to Abilities," *School and Society* (1917), **5**, 178-79.

See D. Fryer, *The Measurement of Interests* (Henry Holt & Co., 1931), pp. 224 ff., for review of this material.

for past events and self-ratings of ability. They postulated a high relationship between interest and ability. As soon as school grades were used instead of self-ratings of ability the correlations dropped appreciably.[2] Terman[3] reported four correlations between rank of interests in a list of school subjects and rank of school subjects based on teacher's ratings of the quality of school work, as follows:

For gifted boys	.44
For gifted girls	.18
For control boys	.48
For control girls	.55

Several studies have contrasted achievement in one or two preferred fields of study with achievement in other subjects. Columba[4] found small differences between the achievement of those sixth- to eighth-grade pupils preferring a subject and the remainder of the class. Commins and Shank[5] report that fifth-grade students preferring arithmetic averaged better in it than in reading but that the reverse did not hold. Langlie[6] had college freshmen indicate the two subjects they had liked in high school, two subjects they had disliked, and the two in which they expected to be interested in college; these preferences were checked against grades after one semester in college. He concluded that there is a tendency to get the best grades in the subjects liked and that dislike is not predictive of lowest grades although students get their best grades in these subjects one-half as frequently as do unselected students. The fact that he found that expectation of interest is not as predictive as interest based on past experience explains, it seems to

[2] J. W. Bridges and V. M. Dollinger, "The Correlation between Interest and Abilities in College Courses," *Psychological Review* (1920), **27**, 308–14.

E. L. Thorndike, "The Correlation between Interests and Abilities in College Courses," *Psychological Review* (1921), **28**, 374–76.

I. King and M. Adelstein, "The Permanence of Interests and Their Relation to Ability," *School and Society* (1917), **6**, 359–60.

D. Fryer, "Interest and Ability in Educational Guidance," *Journal of Educational Psychology* (1927), **16**, 27–39.

[3] L. M. Terman, *Genetic Studies of Genius* (Stanford University Press, 1925), Vol. I, p. 368.

[4] M. Columba, "A Study of Interests and Their Relations to Other Factors of Achievement in the Elementary School Subjects," *Catholic University of America Educational Research Bulletin* (1926), Vol. **1**, No. 7, p. 26.

[5] W. D. Commins and T. D. Shank, "The Relation of Interest to Ability in School Subjects," *Elementary School Journal* (1926–27), **27**, 768–71.

[6] T. A. Langlie, "Interests and Scholastic Proficiency," *Personnel Journal* (1930–31), **9**, 246–50.

the writer, the fairly high correlations reported above; for most of the earlier studies dealt with the relation between interests and abilities in courses already completed. Nemoitin[7] reported statistically significant differences between achievement, as measured by grades, in the subjects the high-school students state they liked best and achievement in all the remaining courses.

Chauncey[8] utilized several hundred cases from the Carnegie Foundation follow-up study in Pennsylvania, principally of seniors at the University of Pennsylvania. He reports that those who claimed "special ability and liking for English" made significantly higher scores on the literature test than those who reported "they should never care to study English again." The same was true for four other school subjects, all that were investigated. (The biserial *r*'s ranged between .50 and .76 for the five subjects.) The positive-preference-students had taken significantly more units in the subject than the negative-preference-students. Both preference and number of credits were found to be independently associated with achievement. The data do not indicate any relationship between general collegiate achievement and direction of student preference. The conclusion is that "the attitudes which students hold toward their collegiate tasks have a direct relation to their academic success." Unfortunately, students were asked to record their "*ability* and liking for" so that a positive relationship should be obtained with achievement; also past courses were rated for which the students knew what the outcome had been.

Harris[9] also found preference for certain subjects, as mathematics and foreign languages, associated with considerably better grades, but the reverse was true for English. He comments:

> It seems to be interest and better work in the harder subjects, those that require consistent application for mastery, that go with above-expectancy grades in general, as against the below-expectancy grades associated with interest or achievement in those subjects in which good work is possible by virtue of general or special background without sustained present effort.

[7] B. O. Nemoitin, "Relation between Interest and Achievement," *Journal of Applied Psychology* (1932), **16**, 59–73.

[8] M. R. Chauncey, "The Educational and Occupational Preferences of College Seniors," *Teachers College Columbia Contributions to Education* (1932), No. 533.

[9] D. Harris, "The Relation to College Grades of Some Factors Other than Intelligence," *Archives of Psychology* (1931), No. 131.

Earlier, Wilson[10] reported a correlation of .34 between the number of courses taken in a department by college students and the scholastic grades gained therein. (Chauncey concurs; see above.) In this investigation it is assumed that selection of courses is an expression of interest. The writer would like to agree with this, but he is mindful of the varied reasons—good and bad—which actuate students in selecting their courses. Consequently the thesis that selection of courses is an expression of interest needs to be carefully evaluated before being used in this connection.

There is evidently some relationship between preference for courses of study and scholastic achievement therein. But the relationships shown above are nowhere near so high as one would naturally suppose. As has been repeatedly pointed out, a single expression of interest, such as saying one likes arithmetic best, is not very reliable. This explains in part the rather low relationships reported. Furthermore, until intelligence is partialed out, achievement must reflect this factor to a very considerable degree. If preference for a school subject is to be used as a basis for selecting that subject, investigation as to the validity of such relationships should be based upon stated preference versus subsequent achievement. So far most studies have been based upon previous achievement.

Relationship between expressed occupational choice and scholastic achievement.—Here the student is asked if he has made a vocational choice, and the scholastic achievement of those with a choice is compared with the achievement of those without a choice. In one case students who are sure of their choice are contrasted with those less sure. It is to be noted that interest is based in most studies upon the single statement of the student that he has a choice.

Kefauver[11] found no difference in the achievement of high-school students who had or had not made a vocational choice; and this conclusion held whether or not students were equated for intelligence. Odell[12] tested 11,500 high-school seniors and later ob-

[10] M. O. Wilson, "Interests of College Students," *American Journal of Psychology* (1927), **38**, 409–17.

[11] G. N. Kefauver, "The Life-Career Motive and Its Effect on High-school Work," *School Review* (1926), **34**, 426–30.

[12] C. W. Odell, "Predicting the Scholastic Success of College Students," *University of Illinois Bureau of Educational Research* (1930), No. 52, p. 25.

tained the college-freshmen record of 1,677 and the complete college record of 486 of them. He concluded:

> The [school grade] average for those who had not made vocational choices was enough below that of those who had made such choices that the difference was statistically significant.

The overlapping between groups was considerable. He does not mention whether or not other factors, such as intelligence, were equated.

At the college level, six[13] of eleven studies indicate that vocation choice is associated with higher grades, one[14] study indicates the reverse, and five[15] studies find no effect. Lloyd-Jones concluded that superior students "seemed to have a better conception of why they came to college and of what they would like to do at the completion of their academic life."

In the Syracuse study definiteness of vocational decision was found to be a "major factor in the student's orientation toward college life."

> On the whole, the students who had definitely decided upon their vocation were the students who stressed scholarly as against social values, who were less disturbed by other personal problems, and who reported a smaller degree of cribbing. Crawford[16] . . . . differentiated five groups of [Yale] students according to their degree of vocational orientation, and found a definite relation between scholastic records and life purposes. "Those who came to college with some definite aim, giving the question of a life career

[13] E. McD. Lloyd-Jones, *Student Personnel Work at Northwestern University* (Harpers, 1929), p. 159; A. B. Crawford, *Incentives to Study* (Yale University Press, 1929), pp. 69–70; D. Katz and F. H. Allport, *Students' Attitudes* (Craftsman Press, Syracuse), 1931; H. D. J. White, "An Application of Mental Tests to University Students," *British Journal of Educational Psychology* (1931), **1**, 279 95, (1932), **2**, 53–70; P. S. Achilles, "Vocational Motives in College," *Occupations* (1935), **13**, 624–28; and D. D. Feder and J. S. Kounin, "Motivational Problems in Student Counseling," *Journal of Applied Psychology* (1940), **24**, 273–86.

[14] M. Neel and C. O. Mathews, "Needs of Superior Students," *Journal of Higher Education* (1935), **6**, 29–34.

[15] D. Harris, *op. cit.*; M. R. Chauncey, *op. cit.*; M. V. Marshall, "The Life-Career Motive and Its Effect on College Work" and "A Note on the Life-Career Motive and Its Effect on College Work," *Journal of Educational Research* (1935-36), **29**, 596-98, (1936-37), **30**, 703; G. S. M. Zorbaugh and G. F. Kuder, "College Grades and the Vocational Motive," *School and Society* (1937), **46**, 62 64; and E. G. Williamson, "Scholastic Motivation and the Choice of a Vocation," *School and Society* (1937), **46**, 353–57.

[16] A. B. Crawford, *op. cit.*, p. 58.

and of their fitness therefor serious consideration, and who kept their aims in mind, made definitely superior scholastic records" . . . . Crawford's final conclusion is that of six possible factors related, in significant degree, to academic achievement, potential ability ranks first and degree of orientation or definiteness of life purpose second.[17]

White contrasted the high intelligence-test students who failed scholastically at the University of London with the low intelligence-test students who succeeded. The latter were more interested in all their work and had more definite specialized aïms than the former. In addition the latter studied longer hours, had better study methods, etc. Achilles found that "decided" students among 4,500 undergraduates did better according to their self-reported scholarship than did the "undecided."

Another approach to this subject is that of Feder and Kounin[18] who report the achievement of three groups of students attending first-year college physics: (*a*) those enrolled in order to meet the Liberal Arts College science requirement, (*b*) those who took the course as part of their pre-medical or pre-dental training, and (*c*) those with "pure" science interests. Despite their superiority in ability the first group showed the poorest achievement. Although the second group earned slightly but not significantly better grades than did the third group, "the latter significantly exceeded the others in quality of insight into the subject as exhibited by the practical applications they were able to make." (No data are published.)

On the other hand, Neel and Mathews found tendencies in the opposite direction. The 200 men and women students from the upper quarter of their class in intelligence were subdivided according to scholarship. The nonachievers had more often reached a definite vocational choice and were slightly more consistent in maintaining that choice.

Of those who report no effect upon scholarship from possession of a vocational choice, Harris reaches this conclusion after allowing for intelligence. Marshall found slight but not statistically significant evidence that those who had made a choice before col-

[17] D. Katz and F. H. Allport, *op. cit.*, p. 376.

[18] *Loc. cit.*

lege did better scholastic work in subjects related to their vocational choice during the first three years in college than in other courses. Zorbaugh and Kuder correlated the vocational decision of 2,051 college women with intelligence-test scores, year in college, and grades and obtained coefficients of .095, .251, and .104, respectively. The third coefficient fell to .03 when year in college and intelligence were partialed out. Williamson considered certainty of choice rather than mere presence or absence of choice. His cases were 860 college freshmen, who were equated for high-school scholarship, scholastic aptitude, and scores on the *Minnesota Survey of Opinion*. The critical ratios for scholarship of the first quarter of the freshman year between the classifications of men on the basis of the degree of certainty of vocational choice ranged from —.3 to 1.0 and for women similarly grouped from —2.7 to —.4.

The writer questions the use of the term "life-career motive" when students are merely asked to state the occupation, if any, they are planning to enter. Such replies have many different implications, ranging from mere guesses to very definite, well-thought-out programs. At the same time any response on this continuum may be accompanied by degrees of seriousness of purpose characterized by "loafing, getting by," and on up to grim determination to succeed. Williamson utilized "vocational choices" reported by 795 among 860 freshmen given at matriculation. There is no such proportion of college freshmen who have a definite choice. Consequently his study makes clear that such choices, often forced by college authorities, are on the average of little or no scholastic significance. Crawford determined vocational choice, on the other hand, from the answers to a number of questions. His choices must have been of more significance than the average.

It would be interesting to determine vocational choice from answers to a rather extended questionnaire given at the beginning of both high school and college, and to correlate the choices with grades in (*a*) the courses elected by students and (*b*) the courses which were "forced" on the students; furthermore, to correlate choices with courses students report they took (*c*) to further their vocational aspirations and (*d*) for other purposes.

II. OCCUPATIONAL-INTEREST SCORES AND SCHOLARSHIP

Occupational-interest scales were designed to differentiate the average member of one occupation from the average man in other occupations. Since some occupational scales correlate to a slight degree with intelligence and other scales correlate negatively (see Table 90, p. 332), it might happen that the former scales would correlate with scholarship and the latter would correlate negatively, since intelligence and scholarship correlate. What are the findings?

The reported correlations between our occupational interests and scholarship in general or in the related field are all low, the highest being .34 with engineering.[19]

Campbell[20] determined the grade-point ratios of 270 engineering students in engineering subjects and in social-science subjects for 197 of these men (all that had had 12 units or more of such courses). These measures of scholastic achievement were correlated with scores on representative occupational-interest scales (see Table 132). Engineering interest correlates significantly with engineering achievement and negatively with social-science achievement, while Y.M.C.A. secretary and social-science teacher interests correlate significantly with social-science achievement and life-insurance-salesman interest correlates negatively with engineering achievement. But the correlations are low and approximate the correlations between these scales and intelligence, so that it is impossible to say that the relationship of the scales to achievement is distinct from that of the scales to intelligence.[21]

[19] K. M. Cowdery, "Measurement of Professional Attitudes: Differences between Lawyers, Physicians, and Engineers," *Journal of Personnel Research* (1926), **5**, 131–41; L. D. Goodfellow, "A Study of Interests and Personality Traits of Prospective Teachers," *Educational Administration and Supervision* (1932), **16**, 649–58; G. W. Holcomb and H. R. Laslett, "A Prognostic Study of Engineering Aptitude," *Journal of Applied Psychology* (1932), **16**, 111; C. F. Glass, "An Investigational Analysis of Certain General and Specific Interests of Engineering Students" (unpublished Doctoral dissertation, Purdue University, 1934), p. 52; Letter of January 25, 1938, from Professor R. H. Palmer, Montana State College. For review of early work, see D. Fryer, *The Measurement of Interests* (Henry Holt & Co., 1931), pp. 234–47.

[20] R. K. Campbell, "The Relationships of Interests to Achievement in Engineering and Social Science Courses" (unpublished Doctoral dissertation, Stanford University Library, 1940).

[21] See p. 545 for other phases of Campbell's study.

Even lower correlations with scholarship have been reported by Brainard[22] with his *Activities Inventory* and Remmers[23] using the *Purdue Interest Report Blanks* rather than those given above. Wolf[24] did not obtain significant differences on either the Brainard or the Stewart specific interest inventories between the scores of sixth-grade girls of superior achievement and those of girls of inferior achievement when both groups were of "relatively equal intelligence."

TABLE 132

CORRELATIONS BETWEEN SEVERAL VOCATIONAL INTEREST SCALES AND ENGINEERING AND SOCIAL SCIENCE SCHOLASTIC ACHIEVEMENT

(After Campbell, Table 11)

Interest Scale	Engineering Achievement		Social Science Achievement		Difference between Two Correlations	
	r	σ_r	r	σ_r	r	C.R.
Engineer	.185	.059	—.140	.070	.325	4.5
Physician	.063	.061	—.085	.071	.148	2.0
Life insurance salesman	—.188	.059	.039	.071	—.227	—3.1
Y.M.C.A. secretary	—.037	.061	.275	.066	—.312	—4.4
Social science high-school teacher	—.030	.061	.308	.064	—.338	—4.8
MF	.028	.061	—.156	.070	.184	2.5

Brush writes:

The use of an interest blank in combination with other measures appears to be a promising technique, especially in view of the fact that interest scores, in this investigation at least, have relatively low intercorrelations with other tests in the battery.[25]

This is illustrated by some data of Brush and Moore. The latter gives a multiple coefficient of .75 between success in physics and a battery of eleven tests in which three interest scales are included.[26]

[22] P. P. Brainard, "Interest Tests in Vocational Guidance," *Vocational Guidance Magazine* (1928), **6**, 156–59.

[23] H. H. Remmers, "The Measurement of Interest Differences between Students of Engineering and Agriculture," *Journal of Applied Psychology* (1929), **13**, 105–19.

[24] S. J. Wolf, "A Comparative Study of Two Groups of Girls of Relatively Equal Intelligence but Differing Markedly in Achievement," *Journal of Applied Psychology* (1937), **21**, 304–10.

[25] E. N. Brush, "Mechanical Ability as a Factor in Engineering Aptitude," *Journal of Applied Psychology* (1941), **25**, 10.

[26] B. V. Moore, "Analysis of Results of Tests Administered to Men in Engineering Defense Training Courses," *Journal of Applied Psychology* (1941), **25**, 634.

When premedical students were distributed in a twelve-fold table on the basis of A, B, and C physician-interest ratings and on the basis of first, second, third, and fourth quarters of intelligence-test scores, Dvorak[27] found that "medical interest is a factor, independent of college aptitudes, influencing scholarship, at least at the upper level of college aptitude." Her sample was too small—only 104 cases all told—to establish this conclusion. Comparison of interest scores of premedical and medical students showed "there is an elimination of the non-interested between the time of entrance to the university and senior year in the medical school."

Although the association between occupational interest scores and scholarship is low, the following study suggests that this association is greater when grades are based on a considerable period of time.

TABLE 133

RELATION OF DENTAL-INTEREST RATING TO SCHOLARSHIP IN DENTAL SCHOOL

(Grade point of 2.00 is passing. Based on original Dental Scale)

Dental-Interest Rating	Total Number in Attendance	1st Year		2d Year		3d Year		4th Year	
		Number Given Final Grade	Average Grade Point	Number Given Final Grade	Average Grade Point	Number Given Final Grade	Average Grade Point	Number Given Final Grade	Average Grade Point
A ...	66	64[a]	2.45	63	2.49	61	2.50	59	2.55
B+...	31	31	2.58	31	2.58	31	2.43	28	2.53
B ...	24	23	2.41	19	2.50	18	2.33	15	2.59
B—...	12	11	2.41	9	2.51	8	2.55	8	2.53
C ...	8	7	2.01	4	1.79	3	2.07	2	2.44

[a] Two students entered the second year.

Dental students.—The data on a four-year follow-up of dental students clearly indicate greater relationship between dental interest and continuation in a dental school than between such interest and scholarship in any one year. Four successive classes filled out the interest test upon matriculation. The grade-point ratios of these 141 students are reported in Table 133, subdivided accord-

[27] B. J. Dvorak, "A Preliminary Report on the Use of the Strong *Vocational Interest Blank* in the Guidance of Pre-Medic Freshmen" (unpublished Master's thesis, University of Minnesota, 1930).

ing to rating received in dental interest.[28] No difference in scholarship is found among students rating A, B+, B, or B—, but students rating C are inferior in this respect.

Table 134, however, presents another view of the same situation. Here it is shown that 92 per cent of freshmen, rating A or

TABLE 134

RELATION OF DENTAL-INTEREST RATING TO CONTINUANCE IN DENTAL SCHOOL

(In percentages of freshman enrollment)

Dental-Interest Rating	Members Who Continued Throughout the Year and Received a Final Grade				Graduated			
	1st Year	2d Year	3d Year	4th Year	In 4 Years	In 5 Years	In 6 Years	Total[a]
A	100	95	92	89	76	12	3	91
B+.....	100	100	100	90	77	13	3	93
B	96	79	75	63	50	17	0	67
B—	92	75	67	67	67	0	0	67
C	88	50	38	25	13	13	0	25

[a] Six students will presumably graduate in June after repeating the work of one or more years.

B+ in dental interest finally graduate as compared with 67 per cent of B or B— students and only 25 per cent of C students. If really satisfactory work is defined as "graduating in four years," then 76 per cent of students rating A or B+ do satisfactory work, in contrast with 59 per cent of B or B— students and only 13 per cent of C students. A and B+ students are nearly four times more successful in the first comparison than are C students and six times more successful in the second comparison.

Table 135 indicates how dental students with an A rating in dental interest differ from students with C ratings as to interest in several other occupations. The former score distinctly higher than the latter on all eight occupations which correlate over .50 with dentistry, and distinctly lower on the two occupations which cor-

[28] These data were accumulated through the co-operation of the late Dean A. R. McDowell of the College of Physicians and Surgeons of San Francisco and of the present Dean, Ernest G. Sloman.

Material in this section is from E. K. Strong, Jr., "Selection of Students for Medical Schools," *Proceedings of the Annual Congress on Medical Education and Licensure*, February 15, 1937. Table 133 has been revised by eliminating incomplete data of the class of 1933 and by completing data of the 1937 and 1938 classes from 1936 to June 1938.

relate below —.50 with dentistry. The interests of the latter assign them to selling real estate and life insurance but to not a single pursuit related to scientific activities. The former, on the other hand, show no interest in selling but show positive interest in dentistry, medicine, and, to a lesser degree, farming, chemistry, and engineering. There is no question that the former should be more interested in the courses given in a dental school and in dental practice afterward.

TABLE 135

VOCATIONAL-INTEREST SCORES AND RATINGS OF DENTAL STUDENTS WHO RATE A AND C IN INTERESTS OF DENTISTS (ORIGINAL SCALES)

Scale	Correlation with Interests of Dentists	50 Dental Students Rating A in Interests of Dentists		10 Dental Students Rating C in Interests of Dentists	
		Average Score	Rating	Average Score	Rating
Dentist	...	292	A	—39	C
Physician	.87	174	A	—118	C
Chemist	.74	109	B	—228	C
Architect	.72	96	C	—175	C
Artist	.62	—52	C	—291	C
Psychologist	.59	—23	C	—247	C
Engineer	58	90	B	—226	C
Farmer	.53	112	B+	—178	C
Life insurance salesman	—.59	—92	C	102	B
Real estate salesman	—.60	—110	C	113	B+

Dental students are not a random selection of high-school or college students. Judging from interest-test scores, they are drawn from a small percentage of the total high-school or college population. This is shown in Table 136, where the percentage of dental students who receive dental-interest ratings of A, B+, B, B—, and C are contrasted with high-school juniors and college seniors. Forty-five per cent of these dental students are rated A in the interests of dentists and 6 per cent are rated C. On the other hand, only 4 per cent of college seniors are rated A in the interests of dentists and 62 per cent are rated C. It is obvious that dental students are not at all a random selection of college students but are drawn from a very small percentage of the entire college popula-

tion. The situation might be stated this way. For every 100 dental students there are needed 1,151 college men in order to supply 45 dental students with an A rating in the interests of dentists. These 1,151 college men will supply, however, three times as many dental students rating B+ as are found in the dental school, seven times as many as are rated B, twenty-two times as many as are rated B—, and 125 times as many as are rated C. There is evidenced here a distinct tendency for those who rate high in dental interest to enter a dental school and for those who rate low not to enter such a school. Such a situation is far removed from what chance would give.

TABLE 136

EXTENT TO WHICH DENTAL STUDENTS HAVE THE INTERESTS OF DENTISTS AS COMPARED WITH HIGH-SCHOOL AND COLLEGE MEN (ORIGINAL SCALES)

Rating	176 Dental Students	415 High-School Juniors	285 Stanford Seniors
A	44.9 per cent	3.2 per cent	3.9 per cent
B+	22.7 per cent	14.2 per cent	5.8 per cent
B	17.6 per cent	21.5 per cent	11.0 per cent
B—	9.1 per cent	23.2 per cent	17.3 per cent
C	5.7 per cent	37.9 per cent	62.0 per cent

Home economics students.—Mather tested 220 home economics freshmen of 1939 and 1940 on the *Vocational Interest Blank for Women* and scored the blanks on the new home economics teacher scale in 1942. She reports that such scores cannot be used "to predict success in student teaching" when grades are employed to measure such success but that "a low interest score on that scale seems to mean lack of interest in teacher education and may mean little success in student teaching." Her data indicate that those who withdraw for marriage, illness, or financial reasons and transfer to another institution have home economics interest scores similar to the remainder but those who withdraw because of poor scholarship or transfer to other curricula have a mean score of 31.4 in contrast to 44.6 for all students and 49.1 for all majoring in the teaching of home economics.[29]

[29] M. E. Mather, "The Use of the *Strong Vocational Interest Blank* in Predicting the Success of Student Teachers in Home Economics," Master's thesis, Pennsylvania State College, 1942.

Differential school grades.—Segel[209a] adds a new feature to the subject. He gives not only correlations between scores on six of the writer's occupational scales and (*a*) grades and (*b*) educational-achievement-test scores but also correlations between occupational-interest scores and (*a*) the differences between grades in two school subjects and (*b*) the differences between achievement scores in two educational subjects (see Table 137). Although the

TABLE 137

CORRELATION BETWEEN SCORES ON *Iowa High-School Content Examination* AND VOCATIONAL INTEREST SCORES

(After Segel)

Parts of the *Iowa High-School Content Examination*	American Council Intelligence	Engineer	Physician	Lawyer	Life Insurance Salesman
American Council Intelligence	...	.10	—.02	.00	—.12
English literature	.62	—.10	—.11	.09	—.04
Mathematics	.57	.49	.28	—.03	—.27
Science	.64	.36	.29	—.01	—.29
History and social science	.59	—.16	—.05	.09	.08
Differences in scores of two examinations:					
English literature-Mathematics	...	—.55	—.36	...	.22
English literature-Science	...	—.46	—.41	...	.25
Mathematics-History and social science	...	.57	.29	...	—.31
Science-History and social science	...	.53	.34	...	—.37
Differences in school grades:					
English-Languages (N = 62)	...	—.01[a]	—.07[a]	.04	—.16
Languages-Mathematics and science (N = 68)	...	—.23	—.07	.22	.23
Languages-History (N = 41)	...	.38	.12	.10	.06
English-Mathematics and science (N = 66)	...	—.24	—.14	.26	.07
Mathematics and science-History (N = 44)	...	.61	.18	—.12	—.17
English-History (N = 42)	...	.37	.05	.14	—.10

[a] Reported as —0.1 and —0.7—typographical errors, according to Segel

[209a] D. Segel, "Differential Prediction of Scholastic Success," *School and Society* (1934), **39**, 91–96; and *Prediction of Success in College* (U.S. Department of the Interior: Office of Education, Bulletin, 1934), No. 15; also D. Segel and S. L. Brintle, "The Relation of Occupational Interest Scores as Measured by the Strong Interest Blank to Achievement Test Results and College Marks in Certain College Subject Groups," *Journal of Educational Research* (1933–34), **27**, 442–45; and D. Segel, "Differential Prediction of Ability as Represented by College Subject Groups," *Journal of Educational Research* (1932), **25**, 14–26, 93–98.

correlations between interest scales and parts of the *Iowa High-School Content Examination* are for the most part quite low, many of them are appreciably higher than correlations between occupational interests and intelligence. This is particularly noticeable in the case of occupational interests of engineer and physician when correlated with mathematics and science. When differences between grades in two subjects, and particularly differences between achievement scores in two educational tests, are considered, the correlations are appreciably greater. Interests of engineers and physicians and to a lesser degree purchasing agents are associated with higher test scores in mathematics and science and lower test scores in English literature and history-social science. The reverse holds for the interests of life insurance salesmen and personnel managers. Such differentiation is more clearly indicated when achievement-test scores are employed rather than teachers' grades.

By combining the scores of the five interest scales by multiple correlation, the four combinations of Iowa examinations in the second part of the table are differentiated, respectively, by coefficients of .68, .54, .61, and .87. "These results show that there is a fairly high relationship existing between some of the Strong interest scores and achievement as measured by the parts of the Iowa test. These relationships are high enough to be considered as factors in the guidance of the student."[30] Segel points out:

> The differential relationships given here show that these interest tests have more power to differentiate between these achievements than they do to show the achievements themselves. Using the relationship as a predictive one this means that these interest scores will predict differences between achievement in subjects better than they will predict absolute achievement in single subjects.[31]

These results are understandable when the techniques involved are taken into account. In subtracting one set of grades from another set, the influence of general ability to get high grades is more or less eliminated from consideration and what is left are the dif-

[30] D. Segel, "Differential Prediction of Scholastic Success," *School and Society* (1934), **39**, 6.

[31] *Ibid.*

ferences between ability to get high grades in one subject and ability to get high grades in the other subject. Similarly in constructing interest scales the interests of successful men in one occupation are subtracted from the interests of successful men in many occupations. Here also the influence of being successful is more or less eliminated and what is left are the differences in interests of men in one occupation from men in other occupations. Consequently what is measured by occupational-interest scales is more comparable to what is measured by differences between two school subjects than to what is shown by performance in any one school subject alone.

Unfortunately the data of Segel are based on small samples and the results cannot be considered to be more than suggestive. But the procedures employed merit further use.

Conclusion.—The interest scales used in these studies were designed to differentiate between interests in different occupations and not to distinguish between degrees of achievement. It is not surprising that occupational-interest scores do not correlate to any great degree with either intelligence or scholastic achievement scores.

When, however, an investigation follows a group of students for a considerable period of time, as in our study of dental students, there is opportunity for students to continue or to drop out of the course. It is here we believe that interests have their most pronounced effect upon scholarship; i.e., the uninterested student does not continue.

All this suggests the following hypothesis: If a student has sufficient interest to elect a course, his grade will depend far more on his intelligence, industry, and previous preparation than on his interest. Interest affects the situation, however, in causing the student to elect what he is interested in and not to elect courses in which he is not interested. When a student discovers he has mistakenly elected a course in which he finds little interest, he will finish it about as well as other courses but he will not elect further courses of a similar nature. Because of this situation it is difficult to obtain a real measure of the relationship between interest and scholarship, since those with less than a fair amount of interest in the subject seldom take the course at all.

III. SCORES ON INTEREST SCALES DIFFERENTIATING COURSES OF STUDY AND SCHOLARSHIP

Since it is possible to differentiate occupations in terms of interests, it would seem possible to differentiate courses of study in the same manner. In a very real sense the latter is accomplished for certain professional courses by occupational-interest scales. Data already presented[82] indicate that dental, engineering, law, and medical students score quite similarly to members of those professions. But there is a real difference between occupational-interest scales and educational-interest scales in that the former are based on the interests of men already established in the occupation whereas the latter are based on the interests of students. Since many of the latter will drop out and never enter the profession, the criterion for educational scales is different from the criterion of occupational scales, and seemingly must always be inferior in validity.

A review of some of the educational scales which have been developed will afford an opportunity to see what has been accomplished and to appreciate some of the difficulties inherent in the undertaking.

The pioneer study in this field was made by Truman Kelley in 1914. It is reviewed briefly on page 603. Another early study was that of Wyman, who developed three interest scales for intellectual, social, and activity interests based upon free-association responses to 120 stimulus words. Her primary groups were seventh-grade pupils who were classified by schoolteachers into those with and those without the three types of interest. The six subgroups ranged from 56 to 71 in size. The scoring keys are very elaborate, involving weights for the three types of interest for 10,880 responses. No appreciable difference appears between "gifted" children and control groups at ages 10 and 14 years, but the older children score slightly higher than the younger. The keys were validated upon 206 children who were divided into "with" and "without" subgroups according to teachers' estimates. The validation correlations were .53 for intellectual, .36 for social,

[82] See Table 116, p. 418.

and .15 for activity interests. A further validation of the scoring keys against the *National Intelligence Tests* and the *Stanford Achievement Test* indicated that when intelligence was held constant there was a correlation of .49 with intellectual, .18 with social, and .03 with activity interests. There is not much evidence here that social and activity interests have been isolated; but since the correlation of .49 between intellectual interests and the *Stanford Achievement Test* is as high as between the former and the *National Intelligence Test* (.46), it is suggested that there is a factor of intellectual interests separate from intelligence as measured by an intelligence test. Wyman concludes:

> A child must be interested to achieve success, the greater the interest and the higher the intelligence, the greater the success—and not that ability to succeed produces the interest.[33]

Garretson[34] gave his *Preference Questionnaire* to several hundred boys in a high school of commerce, an academic high school, and a technical school. Scoring keys were developed from approximately 150 boys from each group whose grades were above the mean. This procedure reduced but did not eliminate ability differences. When critical interest scores were set upon the data from three new groups of students scored on the three scales, these groups were distinguished as follows:

> 84.3% commercial from 71.0% academic and technical
> 79.0% technical from 81.2% commercial and academic
> 66.0% academic from 79.3% commercial and technical

Fryer compared the predictive value of Cowdery's data with that of Garretson's on the basis of percentage of correct predictions from the use of the keys as follows:

Cowdery: Physicians, 71%; Engineers, 73%; Lawyers, 61%

Garretson: Commercial boys, 55%; Academic boys, 43%; Technical boys, 60%

[33] J. B. Wyman, "The Measurement of Interest," *Vocational Guidance Magazine* (1929), 8, 54-60; also her unpublished Doctoral dissertation "On the Influence of Interest on Relative Success" (Stanford University Library, 1924).

[34] O. K. Garretson, "Relationship between Expressed Preferences and Curricular Abilities of Ninth-Grade Boys," *Teachers College Contributions to Education* (1930), No. 396.

Garretson's data indicate that ninth-grade boys can be differentiated on the basis of interests among three curricula, but not to the same degree that professional college men can be distinguished with occupational-interest scales. The technical curriculum is the best differentiated, the academic curriculum the least differentiated.

But scores on these interest scales do not correlate particularly with corresponding school grades (r of .29 between technical interests and achievement, .15 for academic, and .03 for commercial).

Van Tuyl and Eurich[85] administered the *Minnesota Interest Blank* (consisting of 100 occupational and 100 miscellaneous interest items) to college students. Scales were developed for English, social science, foreign languages, natural science, mathematics, and educational administration majors. The items were weighted on the basis of the number of majors distinguished. Reliabilities of the scales ranged from .30 for mathematics to .86 for educational administration. The natural-science scale proved to be the most valid and the social-science the least valid when the scales were tried out on new groups. The rank-order correlations between interests and grades in the major subject ranged from —.38 for mathematics to +.41 for English, with a tendency of the balance toward zero correlations. The authors conclude:

> All that may be said regarding the possible degree of correlation between interests and scholarship in these four groups is that the obtained coefficient may be either positive or negative and will probably be small.

In a second study Walters and Eurich[86] developed scales for science-mathematics, social science, and English based upon criterion groups of 64, 67, and 59 upper-class college women, respectively. Items were given a weight of one if the differences in response of two major groups amounted to three times the probable error of the difference. A weight of two was employed if the item thus separated one group from both of the other two groups.

[85] K. Van Tuyl and A. C. Eurich, "Measuring Interests of College Students with Different Major Subjects," *Journal of Applied Psychology* (1934), **18**, 27–44.

[86] A. Walters and A. C. Eurich, "A Quantitative Study of the Major Interests of College Students," *Journal of Educational Psychology* (1936), **27**, 561–71.

Again the natural science scale proved to be the most valid, the social science the least valid. Social science and English interests are more similar than either one with science-mathematics, which agrees with our results with vocational-interest scales for women. "Students majoring in foreign language and music have interests similar to English majors." The scales accomplish fairly well what they were designed to do, for "freshmen groups which had evidenced preferences for certain major fields were differentiated by significant mean differences in four out of six comparisons." On the other hand, correlations between scores on the three major interests and both intelligence and achievement scores approximate zero, except between science-mathematics interest and achievement in general science (r of .30).

Giles[87] used thirty pictures of men engaged in some sort of "manual," "mental," or "social" work. He reports that 70 per cent of the boys in a junior technical school had higher manual than social scores and that 60 per cent of the boys in a secondary school had higher social than manual scores. The differences are not great, but since we do not know what the true differences are we cannot evaluate the findings except to note that some differentiation was obtained.

Tyler,[88] using her *Minnesota Interest Test for Girls*, developed scoring keys for (1) college preparatory and (2) commercial majors based on the responses of high-school girls. "More than three-fourths of the high school girls in a typical class will be correctly assigned to the course of study they have chosen." Scores on the first scale correlate .30 with the *A.C.E. Psychological Examination*, whereas scores on the second scale correlate —.19. "It appears . . . . that the CP [college preparatory] score is not so much a measure of specific vocational interests as it is an indicator of certain basic attitudes. It corresponds more closely to Strong's Occupational Level scale than to those for specific vocations."

Discussion.—The results stated above indicate that it is pos-

[87] G. R. Giles, "A New Interest Test," *Journal of Educational Psychology* (1936), **27**, 527–36.

[88] L. E. Tyler, "The Measured Interests of Adolescent Girls," *Journal of Educational Psychology* (1941), **32**, 561–72.

sible to differentiate students in terms of major courses of study on the basis of interests in the same way that men are differentiated with respect to occupations. So far this has not been done in a thoroughgoing manner nor with as high a degree of differentiation. Three explanations may be advanced: First, scales have not been based in most cases on large enough samples. Second, the criteria are not as good as with occupational scales, as pointed out above. Third, the interests of students are less stable than the interests of adults who are well established in their occupation.

The ideal procedure for the development of both occupational and educational scales for the professions and some of the occupations would be to test a large number of students and after a period of years base the scales upon the blanks of students who are then engaged in the several occupations. One scale would serve for both occupational and educational interests and it would be free from the changes in interests that take place with increasing maturity. Guidance of high-school and college students could be done more effectively than with existing scales by such procedure. But it would cost money and ten to twenty years of time.

It is not so easy to see what should be done about measuring interests of those majoring in nonvocational subjects. Here the objective is to supply culture or citizenship. If everyone is to take such courses, and many are required, it makes no difference whether the student has the necessary interests or not. Certain it is that many instructors in these subjects talk as though all students should take their courses but at the same time they complain about the lack of interest that is manifest.

If educational-interest scales are developed for liberal arts majors, it will be well to recognize at the start that students in such departments are a heterogeneous lot, containing students who intend to specialize later on in a profession, students who will continue along some line parallel to their liberal arts studies, and students who do not know what they are going to do even after graduation. Liberal arts students differ greatly not only in the courses they take during college but even in the combination of courses constituting their major. It is also important to bear in mind that "liberal arts" must vary considerably in meaning from one educational institution to another; art and music, for example,

are sometimes included and sometimes they appear in separate departments. Professional courses must conform more or less to the needs of students entering those vocations and for this reason are much more alike the country over. Liberal arts courses need meet no definite requirement, and a liberal arts college is pretty much a composite of what the faculty wishes to teach. A good educational-interest scale based on professional students in one institution should function fairly well in another institution, whereas an equally good scale based on liberal arts students in one university should not be expected to function so well elsewhere. It is not surprising that in these investigations educational-interest scales for the natural sciences have been more effective than those for the social sciences.

Educators are interested in majors (courses of study) and in the students who do good work in their courses. If a student selects a major when a freshman and obtains good grades for four years, he is deemed a success. Poor students now receive considerable attention, but unfortunately some of it is amateurish in value and much of it is designed to persuade the poor student to major elsewhere. It is probably rare for a faculty to become interested in whether or not a good student is in the proper major. Many an investigation has shown, however, that there are many good, as well as poor, students who are in the wrong course of study. First-class educational scales might prove to be of value in calling attention to those students whose interests are out of harmony with the curricula in which they are enrolled.

It is also possible that such educational scales might aid in understanding why so many students of high intelligence do poor work and conversely why some students of relatively low intelligence do good scholastic work. The best hypothesis is that the former lack interest and the latter have it. Are interests responsible for this situation?

The data indicate, furthermore, that differentiation of educational interests is more likely to occur at the college level than in high school. That interests are changing more rapidly in high school than in college is one possible explanation. Another reason is that college students are more homogeneous with respect to intelligence than high-school students and intelligence is thereby

better controlled when interest tests are devised. A third reason is that majors are better represented in college than high school.

The main point of Sections II and III of this chapter dealt with the possibility of differentiating scholarship achievement by the use of occupational and school-major interest scales. The evidence is clear that such scales were not designed for this purpose and are not particularly useful in this connection.

Sections IV and V outline what has so far been accomplished when interest scales are developed for the primary purpose of differentiating superior from inferior students.

IV. SCORES ON INTEREST SCALES DIFFERENTIATING SUPERIOR AND INFERIOR STUDENTS IN GENERAL AND SCHOLARSHIP

Kornhauser[39] used an interest blank very similar to that of Freyd's upon 110 college freshmen. He based his scoring procedure upon 15 questionnaires representative of students in the upper quarter of the class, 15 questionnaires representative of the middle half, and 15 questionnaires representative of the lower quarter of the class. Scores so obtained correlated .73 with scholarship of the 45 students but only .17 with scholarship of the 63 other students in the class. He states: "the conclusion appears amply justified that the questionnaire gave results so unreliable that no use can be made of it in predicting the collegiate work of students."

The studies of Ream,[40] Craig,[41] and Kornhauser have been often quoted as proof that the interest test is useless. It is difficult to understand how anyone could have expected satisfactory reliability or validity from populations so small as 25 cases! But even Fryer[42] in 1931 failed to comment on the size of the sample!

Shuttleworth.[43]—Using the *University of Iowa Assayer*, com-

[39] A. W. Kornhauser, "Results from a Quantitative Questionnaire on Likes and Dislikes Used with a Group of College Freshmen," *Journal of Applied Psychology* (1927), **11**, 85-94.

[40] See p. 506.

[41] See p. 507.

[42] D. Fryer, *The Measurement of Interests* (Henry Holt & Co., 1931), p. 220.

[43] F. K. Shuttleworth, "The Measurement of the Character and Environmental Factors Involved in Scholastic Success," *University of Iowa Studies in Character* (1927), Vol. I, No. 2, 80 pages.

posed of 200 general interest items, Shuttleworth tested the freshman class at that university. He developed two scales, one contrasting the interests of the 40 men and 33 women of superior intelligence with an equal number of inferior intelligence; and one dealing similarly with scholarship; the key for intelligence utilized 34 items and the key for scholarship used 60 items. One hundred and twenty of the primary group were scored on both scales. The scores were compared with freshman grades and intelligence-test scores, which were the criteria that had been used for selecting the subgroups upon which the scales were based. Among others these four coefficients are reported:

Scholarship scoring key vs. scholarship	.50
Scholarship scoring key vs. intelligence	.49
Intelligence scoring key vs. scholarship	.18
Intelligence scoring key vs. intelligence	.40

This procedure was repeated with a revised form of the test upon the 1926 freshman class.[44] New keys were devised for men and women. Correlations with first-semester grades were .43 for men and .46 for women. Shuttleworth's conclusion was that his scoring keys did not predict grades as well as the College Entrance Examination, which gave a coefficient of .61.

Jacobsen.[45]—After several preliminary trials Jacobsen developed three scales—one for men, one for women, and one for both sexes,[46] based upon the interest records of 429 men and women superior in both educational ability and intelligence and 459 men and women inferior in educational ability but superior in intelligence. Intelligence was thus held constant. The three scales utilized 112, 90, and 92 items, respectively. The keys were validated on a control group of 300 men and 300 women who were freshmen in 1926, with the following correlations (from her Table 29):

[44] F. K. Shuttleworth, "Environmental and Character Factors Involved in Scholastic Success," *Journal of Educational Psychology* (1929), **20**, 424–33.

[45] M. M. Jacobsen, "The Quantitative Determination of Scholastic Interests among College Students" (unpublished Doctoral dissertation, University of Minnesota, 1928).

[46] The men's key proved to be more successful than the common key for men; for women the women's and the common keys were about equally useful.

	Men	Women
r 1 (Fall Quarter Honor Point Ratio) vs. 2 (College Ability Percentile)	.48	.54
r 1 (Fall Quarter Honor Point Ratio) vs. 3 (Interest Score)	.30	.44
r 23	.21	.40
r 12.3	.45	.44
r 13.2	.23	.29
r 23.1	.08	.22
r 1.23	.58	.63

From these data she concluded "that the measurement of 'scholastic interests' has been achieved, at least to a certain extent."

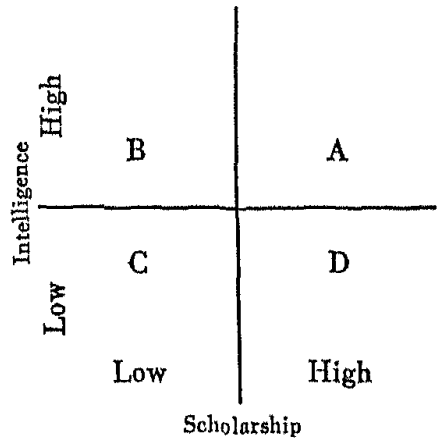


FIG. 46.—Intelligence-scholarship scatter table

Her scholastic-interest scales were based on the differences in interests of groups A and B in Figure 46. If the interest scales measure scholastic interests independent of the intelligence factor, then the average interest scores for Groups A and D should be similar, the average interest scores for Groups B and C should be similar, and, in addition, the scores for Groups A and D should be higher than the scores for Groups B and C. This Jacobsen found to be true with regard to both her men's and women's scales. She states:

"The most outstanding qualitative differences between the groups are (1) that Group A is characterized by the possession of a large number of likes for professional occupations and 'high-brow' miscellaneous items, whereas Group B is characterized by dislikes, indifference to and ignorance of professional occupations and preference for 'low-brow' miscellaneous items." Jacobsen

also found that Group A liked six times as many occupations as Group B; the latter disliked many more items than Group A, particularly in the miscellaneous group (six times as many). Group B was ignorant of more items than Group A, particularly occupations.

The test was used as a part of the personnel procedure at the University of Minnesota, adding about .1 to the prediction value of educational abilities when used with the College Ability Test. Despite these excellent results it is to be noted that few items showed a difference of three times the probable error of the difference between superior and inferior groups and that later use of the scoring keys has indicated that there is continually needed a recalibration of the scales to include the changing interests of these ability groups.

Jacobsen postulated that her two groups differed with respect to their possession of "scholastic zeal." "We are dealing," she states, "with a phenomenon involving multiple causation, industry or its absence and zeal or its absence being merely important and not sole factors. In other words, those who are capable of high scholarship but fail to live up to expectations may contain individuals who fail because of unwise choice of curriculum, lack of efficient methods of study or poor use of time, stresses produced by worry over strained family relationships or finances, and ill health, to mention only a few of the more obvious factors at work." Because of this welter of elements she arrives at the conclusion that data based upon three successive classes of students "will yield an interest index which cannot be improved upon by the mere addition of more cases from more classes." Such evidence as we have (p. 649) indicates that increase of her criterion groups of 233 and 139 women to 500 each would reduce considerable sampling error.

Studiousness.—Two attempts have been made to devise interest scales which would measure, not scholarship, but the difference between the obtained grades and the grades which should be secured in terms of the intelligence possessed by the student.

Studiousness index was defined by Symonds[47] as "the difference

[47] P. M. Symonds, "A Studiousness Questionnaire," *Journal of Educational Psychology* (1928), **19**, 152-67.

between scholastic attainment and intelligence after each is reduced to the common unit of the standard deviation." He developed an interest scale which was weighted against studiousness index for boys in two high schools and against teachers' ratings of studiousness in a third high school. The resulting correlations were suggestive but not conclusive, since data on a new group of boys were not reported.

In the standardization of the "Studiousness Scale" of Young and Estabrooks[48] residual indices (grades with intelligence partialed out) were calculated for 588 male students at Colgate University. Using these indices as a criterion, item analysis was made of the items in five tests and it was found that those included in the *Vocational Interest Blank* were most useful in this connection. The scale was then standardized on this blank by contrasting the one hundred students among the 588 having the highest residual index scores with the one hundred students having the lowest scores. "The items were weighted on the basis of the degree of probability that the difference between the studious group and the unstudious group was not a true difference."

"The Studiousness Index is a measure of all the factors contributing to grades which are not measured by intelligence. It shows how well the student has done in his school work in proportion to his ability. . . . . The only true validity coefficients . . . . are multiple correlations of grades with intelligence and studiousness combined. One cannot, therefore, speak of the validity of the scale, but rather of its usefulness in improving the prediction made possible by the intelligence test."

The scale was next validated on eight new groups of students, three of which are from Colgate. Reliability reported is .80. Correlations between studiousness and grades ranged from .27 to .44 with an average of .33; between studiousness and intelligence, the range was —.10 to .21, with a mean of .08; between intelligence and grades, the range was .30 to .55, with a mean of .45. Increases of the correlation of intelligence with grades by the in-

[48] C. W. Young and G. H. Estabrooks, "Scale for Measuring Studiousness by Means of the Strong *Vocational Interest Blank for Men*" (Stanford University Press, 1936), and "Report on the Young-Estabrooks Studiousness Scale for Use with the Strong *Vocational Interest Blank for Men*," *Journal of Educational Psychology* (1937), **28**, 176–87.

clusion of the studiousness scale ranged from .06 to .22 with a mean increase of .11. Mosier[49] found about the same results with liberal arts students at the University of Florida but not for technical or business students. Williamson[50] tried out the scale on two small groups and one large group of University of Minnesota students, all three from the Arts College. Correlations on the large group are: studiousness vs. A.C.E. test .10; studiousness vs. honor point ratio .20; intelligence vs. honor point ratio .45; honor point ratio vs. intelligence and studiousness combined .48. The inclusion of studiousness score to intelligence yields a negligible increase over A.C.E. alone when correlated with grades.

Conclusion.—The only interest test designed to differentiate superior from inferior students in general that has given satisfactory results is that of Jacobsen. But if her test had been tried out on students in institutions other than Minnesota it is possible that the test would not have given satisfactory results, just as the Young-Estabrooks Studiousness Scale functioned at Colgate but not at Minnesota. The fact that these two scales were successful with new samples each in its own institution indicates that there is some relationship between interests and general scholarship. But it is possible that such interests are tied to particular courses, so that achievement in one group of courses is related to interests different from those in a second group of courses. If this is the case, it might explain why general-scholastic-interest scales do not work at other institutions; for here the students are studying a combination of courses different from that of the original criterion group and may also represent different samplings of students.

If these things are true, the next step in experimentation is to determine whether the differences in interests of superior and inferior students in one school subject are similar or not to the differences in interests between superior and inferior students in another school subject. The next section considers this problem.

[49] C. I. Mosier, "Factors Influencing the Validity of a Scholastic Interest Scale," *Journal of Educational Psychology* (1937), **28**, 188–96.

[50] E. G. Williamson, "An Analysis of the Young-Estabrooks Studiousness Scale," *Journal of Applied Psychology* (1937), **21**, 260–64; also "A Further Analysis of the Young-Estabrooks Studiousness Scale," *Journal of Applied Psychology* (1938), **22**, 105.

V. SCORES ON INTEREST SCALES DIFFERENTIATING SUPERIOR AND INFERIOR STUDENTS IN A SPECIFIC SUBJECT AREA AND SCHOLARSHIP IN THAT AREA

King[51] developed scales for English, mathematics, and science interests of high-school students, using items such as: "Do you intend to finish high school?" "What do you intend to do permanently for a living (four alternatives)?" The weights were based on a comparison of responses to the items of over 800 first-year high-school boys with the highest marks in the various school subjects. When the scales were validated on a group of 100 high-school boys the correlation between the grade predicted from interests and the actual grade was .15 for English and .18 for mathematics.

Rothney[52] constructed five interest scales to measure the scholastic interests of 306 tenth-grade high-school boys in five different school subjects and a sixth scale to measure an average interest. "To eliminate the influence of scholastic aptitude and chronological age on school achievement" the interest scales were based upon D (discrepancy) scores. "Predictions were made of the students' achievement on the basis of scores on the *Terman Group Test of Mental Ability* and chronological age. Actual age was then subtracted from predicted scores to obtain measures of achievement uncorrelated with age and intelligence test scores." (The formula used for determining the weights for the interest items is given on p. 612.) Correlations between subject interest and subject grades ranged between .49 and .58 for the criterion group but between .08 and .21 for a new group of 149 boys. He concluded that his "inventory has no value for the prediction of academic success."

Many of the items used by Rothney were quite specific. It is a tenable hypothesis that more general items, such as "travel movies," may vary less in response from one group to another

[51] L. H. King, "Mental and Interest Tests. Their Evaluation and Comparative Effectiveness as Factors of Prognosis in Secondary Education," *Teachers College Contributions to Education* (1931), No. 444.

[52] J. W. M. Rothney, "Interests of Public Secondary-School Boys," *Journal of Educational Psychology* (1937), **28**, 561–94.

than specific items such as, "movies like *Horse Feathers* and *The Kid from Spain.*"

Dunlap.[53]—Items pertaining to seventh-grade school subjects were checked by about 280 children of that grade as to whether they were liked or not. "Each item was then evaluated for its predictive value by comparison with the scores on the corresponding sub-tests of the *New Stanford Achievement Test.*" A new preference blank of 214 items was administered to two new groups, one a half-year below and the other a year in advance of the original group. The preference blanks were scored for interest in arithmetic, geography, etc. "The average correlation between the various achievement scores on the *Metropolitan Achievement Test* and preference scores is .47 for the seventh grade and .42 for the eighth grade. . . . . The smallest correlation, .40, occurs for geography for the eighth grade and the highest value, .60, for seventh grade general achievement. . . . . The *Terman Group Test* correlates higher with the sub-tests of the achievement test than do the scores on the preference blank. This is not unexpected as it is well known that the scores on group intelligence and achievement tests have high inter-correlations. . . . . The score, however, on the preference blank for any particular subject represents only three minutes of testing time, whereas the score on the Terman test represents approximately 30 minutes." Partial correlation between achievement and expressed preferences, independent of the effects of intelligence, are all positive, ranging from .15 to .40 and averaging .27. Dunlap concludes: "If the preliminary form of the preference blank were extended and refined, the expressed preferences of an individual could be used to increase materially the accuracy of the prediction of future academic success at the junior high school level."

In another article, Sharkey and Dunlap[54] presented data to show that the reliability of the *Preference Test* compared favorably with that of the *Metropolitan Achievement Tests* and that of

[53] J. W. Dunlap, "Preferences as Indicators of Specific Academic Achievement," *Journal of Educational Psychology* (1935), **26**, 411–15; see also, "The Predictive Value of Interest Test Items for Achievement in Various School Subjects," *Journal of Applied Psychology* (1935), **19**, 53–58.

[54] V. J. Sharkey and J. Dunlap, "Study of Reliability and Validity of the *Academic Preference Blank*," *Journal of Educational Psychology* (1940), **31**, 103–10.

the *New Stanford Achievement Test* while the time required to administer the three tests was in the ratio of 1:18:12. "When the several scores on the *Academic Preference Blank* were correlated with the scores on the corresponding sub-tests of the *Metropolitan*, the validities ranged from .32 to .73, with a median of .57. When the sub-tests of the Stanford were used as criteria, the validity coefficients ranged from .28 to .72, with a median of .52. While it is true that some of these values are not great enough to reduce appreciably the standard error of estimate upon which predictions may be made, nevertheless, in general, they are considerably higher than those which have been previously reported for measures of interests." His conclusion was that the *Preference Test* was "68 per cent as efficient in predicting achievement as one achievement test is in predicting the other test."

The median correlation between the *Preference Blank* and the *Terman Group Test of Mental Ability* for the different grade groups was .62. This "is not much lower than the *r* between two group intelligence tests" (Pintner gives a median *r* in this connection of .70). To show that the *Preference Test* is not another intelligence test in disguise, Dunlap contrasted the scores of pairs of individuals of equal intelligence but different academic achievement and obtained critical ratios of 3 or higher in 13 comparisons among 16. But when the scores of pairs of individuals were matched for achievement but different IQ, there were no significant critical ratios, the majority being below 1. "The evidence," he states, "indicates that although the blank is partially saturated with the factor of intelligence, in addition it is measuring another factor contributing to achievement. Whether this factor is interest, preference, or what, is beyond the scope of this study."

At the college level.—Only three studies of this type have been noted by us regarding college students. The first of these is that of Dimmick,[55] who contrasted the interests of 72 superior and 61 inferior students among 250 in elementary psychology, a year course. Interests were recorded on Miner's blank for the *Analysis of Work Interests.* He obtained one critical ratio of 3 and five ranging from 1.9 to 2.2 among the twenty-eight pairs of items.

[55] C. R. Dimmick, "Interest Correlates of Superior and Inferior Achievement in General Psychology," *Journal of Educational Psychology* (1936), **27**, 278–83.

Here again there are too few subjects and also too few items to establish a good scale. In addition there was no control of the intelligence factor nor any validation on a new group.

A preliminary study of Mercer[56] suggests the possibility of differentiating successful and unsuccessful home-economics students. Sixty pairs of women were included in the study who had approximately equal high-school achievement (*Regents' Examination*) and intelligence (*American Council Examination*) but who differed in college grades over two years in New York College of Home Economics at Cornell University. Many significantly different interest responses on the *Vocational Interest Blank* for women were obtained.

Campbell.[57]—In his thesis Campbell postulated that interests associated with scholastic achievement in one subject might not be associated with achievement in other fields of study. This would mean that when the interests of superior and inferior students are contrasted for a heterogeneous group of students, such as in a liberal arts school, the results would be quite different from those obtained in contrasting superior and inferior engineering students or superior and inferior business school students. The conflicting results of Young-Estabrooks, Mosier, and Williamson could then be explained on this basis.

To meet the situation Campbell contrasted the interests of superior and inferior students with respect to engineering subjects and contrasted similarly the interests of superior and inferior students with respect to social science subjects. To control many extraneous factors he used in both cases data from a group of engineering students who have had twelve or more units of work in both fields.

His data prove that

1. There are interests related to (*a*) engineering achievement, (*b*) social science achievement, and (*c*) intelligence.

[56] M. Mercer, "A Study of Interest Patterns of Successful and Unsuccessful Home Economics Students Entering College with Similar Achievement and Aptitude," *Journal of Applied Psychology*, 1942, **26**, 738–53.

[57] R. K. Campbell, "The Relationships of Interests to Achievement in Engineering and Social Science Courses" (unpublished Doctoral dissertation, Stanford University Library), 1940.

2. There are significant differences between the relationships of these interests to any one of the three variables and the interest relationships to the other two.

His basic data were biserial correlations which were calculated between the responses to 320 of the items on the *Vocational Interest Blank* and (*a*) grade-point ratios of engineering students in engineering subjects, (*b*) grade-point ratios of these students in social-science subjects, and (*c*) intelligence-test scores. The first proof of his conclusion was based on the following: The biserial correlations were divided by their standard errors and the distribution of the resulting quotients was compared with the distribution to be expected if no true interest-achievement relationship existed. Using the chi-square technique it was found that the obtained relationships in all three cases would occur by chance less than once in a million times.

A second proof of difference was developed in similar fashion, but here the distributions were in terms of the differences between two sets of biserial coefficients divided by their standard deviations. Such distributions were also shown to be distinctly different from a chance distribution.

A third proof of this was secured by developing three interest scales which differentiated the superior and inferior engineering students in (*a*) engineering subjects, in (*b*) social science subjects, and in (*c*) intelligence-test scores. Items were weighted on the basis of r/σ_r, but items with quotients of less than 1.5 were excluded. This gave scales of 79 items, 110 items, and 136 items, respectively, and reliabilities of .66, .89, and .80, respectively. Correlations between scores of 100 blanks, used in constructing the scales, and measures of achievement are given in Table 138. Only three correlations are statistically significant in this table, showing that the engineering-achievement-interest scale is correlated with engineering grade-point ratios and not with social-science grade-point ratios or intelligence-test scores and similarly for the social-science achievement-interest and the intelligence-interest scales.

A fourth proof was submitted in terms of correlations between the biserial correlations, which were obtained by correlating re-

TABLE 138

CORRELATIONS BETWEEN ACHIEVEMENT-INTEREST SCALES AND ACHIEVEMENT IN (*a*) ENGINEERING, (*b*) SOCIAL-SCIENCE SUBJECTS, AND (*c*) INTELLIGENCE-TEST SCORES

(After Campbell)

Tests	2	3	4	5	6
1. Engineering Achievement-Interest Scale	—.188	.102	.466	.064	.092
2. Social-Science Achievement-Interest Scale	....	—.015	.039	.322	.024
3. Intelligence-Interest Scale	....	....	.051	.065	.458
4. Engineering Grade-Point Ratio	....	....	....	.378	.173[a]
5. Social-Science Grade-Point Ratio	....	....	....	....	.169[a]
6. Intelligence-Test Score	....	....	....	....	....

[a] Correlations between Engineering and Social Science Achievement and Intelligence Test Scores varied considerably, depending upon the intelligence test used and particularly the part of the test considered, i.e., from —.02 to .47. The correlations reported here are based upon "all intelligence tests." The best differentiation between both engineering and social science grade-point ratios and intelligence test was obtained with the I E R. Special Arithmetic Examination, where the correlations were, respectively, 34 and —.02.

sponses to the items with grade-point ratios of engineering and social-science subjects and with intelligence-test scores (referred to above). These correlations are:

Engineering achievement interests vs. intelligence achievement interests ..... .198
Engineering achievement interests vs. social-science achievement interests ..... .121
Social science achievement interests vs. intelligence achievement interests ..... .219

These correlations indicate that liking for an item, which may to a degree be predictive of one type of achievement in this particular group of students, is not predictive to the same relative degree for achievement in the other two areas. In other words, just as a horse and buggy and an automobile have certain similarities and at the same time significant differences, so the interest relationship as measured by these items for engineering achievement and social-science achievement have slight similarity but at the same time are essentially different.

Unfortunately Campbell did not carry his investigation far enough to demonstrate how well the three types of achievement interests can be identified in an everyday counseling situation.

CONCLUSION[58]

One would naturally expect to find scholarship more closely associated with intelligence than with interest. The studies so far reported bear out this hypothesis. But interest tests have not yet been developed to the same degree as intelligence tests and it is possible that interest plays a greater role than is now recognized.

Differentiation in terms of interests of superior and inferior men in an occupation, or in a school, has not yet been accomplished with anything like the differentiation obtained between occupations. It is possible that this is as it should be. Occupations are grouped as far as interests are concerned in terms of the kinds of things which are handled. Occupational Groups I to IV are interested in mechanical, scientific things, Group VIII in office activities, Group X in language activities, etc. There is little justification for believing that men can be grouped on an interest basis with respect to the procedures employed regardless of the things handled. We have shown that executives do not constitute a group by themselves; they are similar in interests to the men working in the same departments. Similarly teachers are grouped in terms of the things they teach, not with respect to the function of teaching.[59] Differences between superior and inferior men in any field would seemingly pertain to *how* they handle things, since they must handle much the same things. If so, it may actually be that the interests of superior and inferior men in the same field are much alike. On the other hand, the lack of success in differentiating the superior from the inferior may be the result of inadequate methods. This conclusion is justified at present because the more extensive investigations listed above have shown on the whole some differentiation.

What should a first-class investigation of this subject involve? First, there should be ample samples of the superior and the inferior. To locate, for example, five hundred failures or near-failures in school is not easy. With our facilities it was impossible to locate even a hundred men who had failed in life insur-

[58] Much of the material has already been summarized and criticized in the conclusions at the ends of sections of the chapter.

[59] See p. 161.

ance—managers do not keep the necessary records nor are they interested in doing so.

Second, a wide variety of items are needed. All classes of items should be represented with a sufficient number of each type. Judging from results our blank is better than many others in this respect; but we frankly confess we have never attempted a thoroughgoing analysis of items for lack of necessary funds. Items possessing temporary interest should be eliminated from scales to be used for any period of time. This probably means the elimination of names of men now living, magazines, books except the classics, movies, and the like. Items of limited geographical interest should also be eliminated, as "subway" or "rodeo."

Third, it must recognized that the younger the group the greater are the changes in interests in a short period of time, changes because of lesser stability in interests and because of increasing maturity.

Fourth, badly skewed distributions must be handled. For example, although there are good examples of men with high engineering interest who have never studied engineering, there are very few cases in our experience of men with low engineering interest who have studied the subject. The latter situation is one of the best proofs there is that interests are related to choice of majors and presumably to scholarship. But how can such evidence be statistically handled when it consists of mere absence of data?

Fifth, since students can be differentiated for the most part in terms of occupational interests it is entirely possible that such differences are greater than will be found between superior and inferior members of such groups. It would therefore seem desirable to subdivide students on the basis of vocational interests and then attempt to differentiate the superior from the inferior in each subgroup separately. It is quite conceivable that an item may be associated with good scholarship among engineers and the reverse among journalists.

Part Six

DIFFERENTIATION OF SKILLED TRADESMEN

Chapters 21 and 22 outline difficulties of differentiating skilled tradesmen when using the procedures employed with professional and business men. Another procedure is presented for this purpose. The research in this connection has added considerably to our understanding of the whole subject.

Chapter 21. Point of Reference[1]

Vocational guidance takes into account that some youths are better fitted for the professions, some for the trades. In counseling the former the question is: "Which profession?" In advising the latter the question is: "Which trade?"

Seldom does the situation arise where a counselor seriously considers whether or not a young man should choose between this profession and that trade. (Actually such counseling is often indulged in, but it is usually to help guide a young man not at all fitted for the professions to see the advantages in some trade for which he is adapted.)

In everyday thinking, occupations are similarly assigned to strata representing varying degrees of income and prestige value and, as we have seen in chapter 10, varying degrees of intelligence and interest. The measurement of occupational interests, on the other hand, has been carried on in terms of an unwitting acceptance of an occupational level to which all belonged. With the revision of the men's scales it became apparent that this level was representative of the better-paid and socially more-approved business and professional occupations. (The revised men-in-general group typifies just this.) Scores on occupational scales have indicated which occupation to choose from those in this stratum. But no attention had been given to the problem: to which stratum does the youth belong? Nor, to the further question: to which occupation does he belong if it is shown that he belongs to any but the higher strata?

Little harm has been done so far in pursuing this course, since

[1] The first reference to this topic is: E. K. Strong, Jr., "Significance of the Point of Reference," *Psychological Bulletin* (1939), **36**, 548.

the great majority of those tested have been students in senior high schools or colleges, all holding the conception that they were destined for the upper stratum of occupations and many properly belonging there. But the more recent use of the *Vocational Interest Blank* with all manner of men and women forces the necessity of considering its use in lower occupational strata.

The development of the occupational-level scale has made it apparent that the interests of men in the upper socio-economic levels are so different from those of the average man and so decidedly different from those of unskilled and semiskilled workmen that these various strata can be differentiated in terms of interests. Several issues naturally arise. First, is it worth while from the standpoint of guidance in terms of interests to determine the man's occupational stratum? Second, is it easier to differentiate all occupations from the standpoint of the average man or to group occupations according to the stratum to which they belong and then differentiate the occupations in each stratum without reference to other strata?

Should the interests of men and women be measured with the same blank and on the same scales or should there be separate blanks and scales for each sex? This problem seems unrelated to the one just discussed; but actually it involves much the same theoretical considerations, for here again there is the practical issue: can all persons be measured better from one or from several points of reference?

The purpose of this chapter is to show how differentiation between occupations is affected by using different men-in-general groups. The resulting information gives us a better basis for understanding what correlations between occupations really mean.

DISCOVERY OF THE PROBLEM

The phenomenon discussed in this chapter was first encountered during 1935 in the development of occupational scales for women. The women-in-general group was originally composed of 586 married women. Eight occupational scales based upon this point of reference gave intercorrelations ranging between .61 and .95, with an average of .77. Such correlations indicated

that there was no great difference between the interests of women in the eight occupations. When, however, another women-in-general group was used, composed of 3,127 blanks drawn from 15 occupations plus the blanks of 1,256 married women, different intercorrelations between occupational scales were obtained. These correlations range between —.85 and .88 for the same eight occupations and average .12.

Dr. H. D. Carter, then employed as an assistant, made a factor analysis of the intercorrelations based on the married-women-in-general group. When the first factor was removed, the residuals were very small (average being .05). Apparently there are differences in interests between married women and professional-business women which are great enough to swamp the differences in interests among professional and business women considered alone.

In view of the fact that the original men-in-general group was a mere summary of most of the blanks in our files at the time it was constituted, in revising the men's blank and scales it was deemed important to base the scales upon a men-in-general group which had definite meaning. Accordingly such a group was constituted with a good deal of care to represent the average of all men in this country, 18 to 60 years of age (see Table 186, p. 704). But the intercorrelations between the first eight scales developed from the revised men-in-general group were disappointing, since they averaged .27, whereas the corresponding intercorrelations between the scales based on the original men-in-general group averaged —.03. This represented a distinct decrease in differentiation among such occupations as physician, C.P.A., engineer, lawyer, life insurance salesman, minister, and Y.M.C.A. secretary.

Extensive research for over a year finally convinced us of two things: first, occupations from the upper socio-economic levels could not be as well differentiated using a men-in-general group representative of all men in the United States as by using a men-in-general group representative of the upper socio-economic occupations alone. And, second, occupations from the lower socio-economic levels could not be well differentiated using a men-in-general group representative of the upper socio-economic

levels but presumably could be well differentiated by using a men-in-general group representative of their level.

Consequently we abandoned the men-in-general group representative of all men in the country as a basis for the revised occupational scales and employed instead a men-in-general group representative of the upper socio-economic levels.

HOW CORRELATIONS ARE AFFECTED BY DIFFERENT MEN-IN-GENERAL GROUPS

Table 139 presents four different sets of correlation coefficients between pairs of occupations (only one-third of the entire table

TABLE 139

CORRELATIONS BETWEEN OCCUPATIONS ACCORDING TO THE MEN-IN-GENERAL GROUP USED IN CONSTRUCTION OF THE SCALES

Correlation Groups	Old Men-in-General Group	Revised Men-in-General Group P_1	1,000 Men-in-General Group P_2	Skilled, Semi-skilled, Unskilled Men-in-General Group P_3
Lawyer and C.P.A.	.36	.57	.85	.91
Lawyer and Life insurance salesman	.31	.47	.73	.82
Lawyer and Physician	.14	.16	.56	.65
Lawyer and Engineer	—.39	—.44	.07	.29
Lawyer and Accountant	—.48	—.42	.36	.61
Lawyer and Minister	.14	.26	.48	.63
Lawyer and Y.M.C.A. secretary	—.17	.04	.33	.53
Lawyer and Office man	—.54	—.41	.37	.61
Lawyer and Social science teacher	...	.17	.46	.65
Lawyer and Y.M.C.A. physical director	—.41	—.21	.13	.42
Lawyer and Farmer	—.47	—.66	—.01	.37
C.P.A. and Life insurance salesman	.07	.19	.59	.76
C.P.A. and Physician	—.18	—.10	.45	.57
C.P.A. and Engineer	—.04	—.17	.25	.38
C.P.A. and Accountant	.45	.28	.69	.80
C.P.A. and Minister	—.09	.06	.32	.54
C.P.A. and Y.M.C.A. secretary	.02	.05	.27	.53
C.P.A. and Office man	.15	.06	.55	.73
C.P.A. and Social science teacher	...	.14	.36	.61
C.P.A. and Y.M.C.A. physical director	—.20	—.20	.03	.36
C.P.A. and Farmer	—.24	—.59	.01	.37
Mean of 66 such comparisons	.01	.02	.22	.42

is reproduced). For example, the interests of certified public accountants correlate —.18, —.10, .45, and .57 with the interests of physicians. Another more extreme case is that between lawyers and accountants, with correlations of —.48, —.42, .36, and .61. Surely these can't all be correct! The facts of the case are that all four sets of correlations are equally valid. The scales used here are based upon exactly the same blanks in the last three sets of correlations and upon approximately the same individuals in the first set of correlations. All of the correlations are based upon the blanks of 285 Stanford seniors which were scored on all the scales. The probable errors of such coefficients are .04 or less, and consequently the differences cannot be credited to chance errors.

The correlations in column one of Table 139 are those previously reported with the old scales before revision. The correlations in column two are those obtained from the revised scales and given in Table 193 (facing p. 716). They provide the basis for the classification of occupations given in chapter 8. Casual inspection discloses the fact that these two sets of correlations agree very closely—actually the rank-order correlation between them is .955. The correlations in columns three and four of the table are considered below and also in the next chapter.

Four men-in-general groups.—Since the original data and the procedures in calculating the correlations in Table 139 are practically identical in all four columns except for the fact that the scales are based on four different men-in-general groups, we must look for an explanation of the variations in the correlations in terms of these men-in-general groups. What, then, is the composition of these groups?

The first men-in-general group is the one described in Table 185 (p. 703) and used with the unrevised scales. The second men-in-general group is the one from which all the revised scales have been calculated, representative of business and professional men earning $2,500 a year and upward (see Table 190, p. 712). From the fact that the results of using the old men-in-general group and this $2,500 men-in-general group are very similar, we judge that the old men-in-general group is also representative of men from the upper socio-economic stratum of society. This fact

is self-evident when the respective compositions of these two men-in-general groups are compared.

The third men-in-general group is representative of all men between the ages of 18 and 60 years, taking into account their age, occupation, and, as nearly as possible, their amount of education. (See p. 704.)

The fourth men-in-general group is representative of unskilled, semiskilled, and skilled workmen and is composed of the first three groups included in the 1,000 men-in-general group. The three subgroups are represented by 258, 173, and 122 men, respectively; accordingly the group as a whole averages somewhat below the average for semiskilled workmen.

The first and second men-in-general groups typify the upper strata of occupations; the third represents all men, but its average falls at about the level of skilled tradesmen; and the fourth represents workingmen, but its average falls below that of the average semiskilled workmen.

P_1, P_2, and P_3.—As the old men-in-general group has now been discarded, we shall concern ourselves only with the other three groups. For convenience they will frequently be referred to as P_1, P_2, and P_3 (P having reference to the term point of reference). P_1 represents the upper and P_3 represents the lower socio-economic levels; P_2 is a sampling of all men, but because there are more men in the lower than upper levels it represents on the average skilled workmen.

The variables that are correlated.—The first point to note in explaining the four sets of correlations in Table 139 is that strictly speaking the correlations are not between two occupations as the heading in the table would imply. The heading in the table should really read "Correlation between the differences in interests of certified public accountants and men-in-general and the differences in interests of physicians and men-in-general." This makes it obvious that changing the men-in-general group will affect the correlations.

How the scoring of a single item is affected.—How the use of different P's (points of reference) affects the scoring of a single item is illustrated by the following example:

Group	Percentage			Difference in Percentage of Occupation and M-in-G			Weight Assigned to Difference in Percentage		
	Like	Indifference	Dislike	Like	Indifference	Dislike	Like	Indifference	Dislike
Occupation	28	36	36						
(M-in-G)$_1$	16	43	41	12	—7	—5	1	0	0
(M-in-G)$_2$	42	33	25	—14	3	11	—1	0	1
(M-in-G)$_3$	46	32	22	—18	4	14	—2	0	1

Here the members of an occupation react to a given item by 28 per cent liking it, while the three men-in-general groups like the item by 16, 42, and 46 per cent, respectively. The differences between the occupation and the three men-in-general groups are 12, —14, and —18 per cent, respectively; such differences being assigned scoring weights of 1, —1, and —2. If an individual responds to this item by liking it, he is given a weight of 1 on the Occupation-P_1 scale, a weight of —1 on the Occupation-P_2 scale, and a weight of —2 on the Occupation-P_3 scale. Necessarily, as far as this item is concerned, the individual's response correlates negatively between the P_1 and the P_2 or P_3 scales but positively between the P_2 and P_3 scales. It is evident that different correlations may be obtained by changing the men-in-general groups.

Actually the responses of the various men-in-general groups are far more similar for most of the 400 items than is suggested by the above example. Such differences as there are nevertheless cause some changes in the weights assigned to scales of the same occupation but with different points of reference. It is these differences in weights that cause the differences in correlation reported in Table 139.

Three hypotheses.—Possibly the easiest way of explaining the relationships between a number of occupations and three points of reference is to illustrate them with the diagram in Figure 47 and then to show how our data may be explained on such a basis. In the figure we have eight occupations represented by the letters *A* to *H* and three points of reference by P_1, P_2, and P_3. From this diagram we can set up three propositions which can then be tested in terms of our data.

1. If occupations cluster evenly about a P, the average correlation between all pairs of occupations (including each occupation with itself) is zero. This is so because the sum of all positive cosines will equal the sum of all negative cosines. This is illustrated by the eight angles and cosines between *A* and the eight points *A* to *H*, which cluster evenly around P_1 (see Table 140).

2. The farther removed P is from a cluster of occupations, the higher will be the average cosine (correlation) between all pairs of occupations. This is illustrated in Table 140 where the eight correlations with occupation *A* in terms of P_1 have an average cosine of 0; in terms of P_2, the average cosine[2] is .67; and in terms of P_3 it is .84.

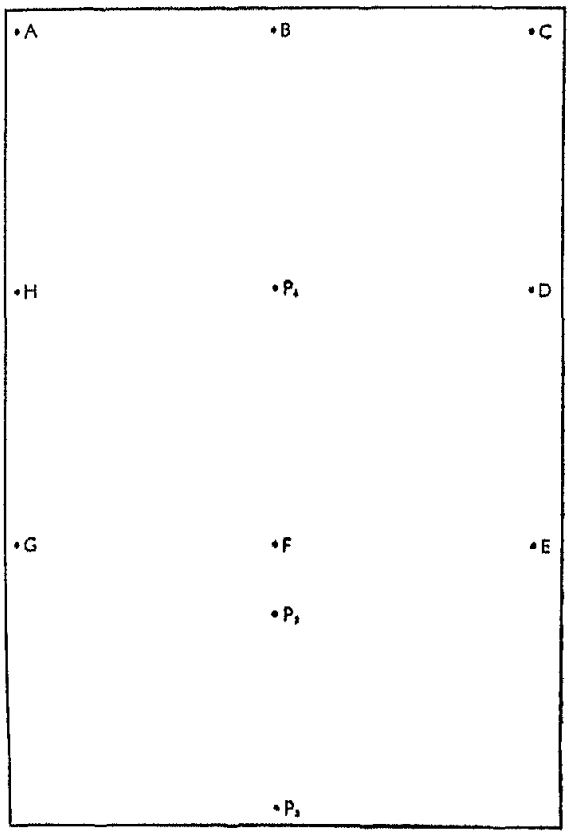


FIG. 47.—Diagram showing relationships among occupations (A to H) which cluster about P_1 and the new relationships when scales are based upon P_2 or P_3, instead of P_1.

3. Regardless of the correlations between occupations obtained from using different P's, the occupations do not change their relative positions nor the interrelationships among themselves. This is, of course, the converse of the second proposition, which postulates the possibility of different sets of correlations between the same identical points, the variation in correlations arising solely from changes in the position of the point of reference.

Consider now how our data may be explained in terms of these propositions.

[2] The average cosine of all possible pairs is .54 (i.e., calculated from *A*, *B*, *C*, etc., instead of from only *A* as in Table 140).

The average correlations of .01 and of .02 in columns 1 and 2 of Table 139 suggest in terms of proposition one that the occupations cluster about their P. Furthermore, the more positive correlations of .22 in the P_2 column and of .42 in the P_3 column suggest that P_2 and P_3 are farther away from the center of this cluster of occupations than is P_1. Is there any proof of this?

TABLE 140

ANGLES AND COSINES OF ANGLES (CORRELATIONS) BETWEEN "OCCUPATIONS" (*A* TO *H*) IN FIGURE 47 ACCORDING AS SCALES ARE BASED UPON P_1, P_2, OR P_3

Angle	Degree	Cosine	Angle	Degree	Cosine	Angle	Degree	Cosine
$A\,P_1\,A$	0	1.00	$A\,P_2\,A$	0	1.00	$A\,P_3\,A$	0	1.00
$A\,P_1\,B$	45	.71	$A\,P_2\,B$	24	.91	$A\,P_3\,B$	18	.95
$A\,P_1\,C$	90	0	$A\,P_2\,C$	48	.67	$A\,P_3\,C$	37	.80
$A\,P_1\,D$	135	—.71	$A\,P_2\,D$	63	.45	$A\,P_3\,D$	45	.71
$A\,P_1\,E$	180	—.100	$A\,P_2\,E$	99	—.17	$A\,P_3\,E$	63	.45
$A\,P_1\,F$	225	—.71	$A\,P_2\,F$	24	.91	$A\,P_3\,F$	18	.95
$A\,P_1\,G$	270	0	$A\,P_2\,G$	308	.62	$A\,P_3\,G$	333	.89
$A\,P_1\,H$	315	.71	$A\,P_2\,H$	345	.97	$A\,P_3\,H$	352	.99
Average		0			.67			.84

Distance of P's from the occupations.—It was surmised that P_1, P_2, and P_3 might be shown to occur along a scale represented at one end by the interests of the upper socio-economic occupations and at the other end by the interests of the lower-level occupations. The OL scale was originally developed for the purpose of substantiating this hypothesis. The scale having been developed, blanks belonging to the several occupations and the three P's were scored on the scale. It was found that P_1 is located at 60 standard score on the scale, P_2 at 50, and P_3 at 46.

The results as far as Table 139 is involved are presented graphically in Figure 48, where the occupations and the three P's are located vertically in terms of OL standard scores and horizontally in terms of IM standard scores (see Table 87, p. 324). (It must be remembered that the complete picturization of these occupations would necessitate five-dimensional space, not two-dimensional, and consequently any calculations based on the positions of the occupations in the diagram will only roughly approxi-

mate the data obtained from scoring the blanks. Even so the cosines calculated from Figure 48 correlate about .70 with the correlations based on scored blanks.)[8]

In terms of the OL scale we have statistical proof that P_2 and P_3 are farther away from the cluster of occupations listed in Table 139 than is P_1.

Another procedure for measuring the relative "distances" between an occupation and two P's is by calculating the percentage of responses that are different between the occupation and the two P's. For example:

	L	I	D	Total	Percentage of Different Responses
Occupation	30	40	30	100	—
P_1	42	32	26	100	—
Percentage of common responses	30	32	26	88	12
P_2	50	30	20	100	—
Percentage of common responses	30	30	20	80	20

In the first case there are 30 like responses common to the occupation and the P-group, 32 common indifferent responses, and 26 common dislike responses, a total of 88, which leaves 12 per cent of responses which differ between the two groups. The mean percentage of different responses to the 400 items on the blank for several occupations listed in Figure 48 and both P_1 and P_2 have been calculated and are given in columns 7 and 5, respectively, of Table 141. For example, the mean percentage of different responses between lawyer and P_1 is 9.3 and that between lawyer and P_2 is 15.0. Lawyers differ more from P_2 than from P_1 by 5.7 per cent. In other words, P_2 is "farther away" from lawyer than P_1.

Table 141 makes clear that this measure of distance is definitely related to the measure of distance in terms of OL standard scores. Mean OL scores are given in column one of the table for

[8] It would be preferable to use factor loadings from factor analysis in which the factors have been so rotated as to give maximum OL loading on one co-ordinate and zero loadings on the other four co-ordinates. Unfortunately P_1, P_2, and P_3 were not included in our factor analysis. In consequence we have used standard scores, since the material in chapter 14 has made clear that the same classification of occupations results from the use of co-ordinates based on standard scores of the IM, MF, and OL scales as on co-ordinates from factor analysis.

each occupation. The second column gives the "distance" in OL scores between each occupation and P_2; similarly for P_1 in column three. Column four gives the amount that the occupation is farther

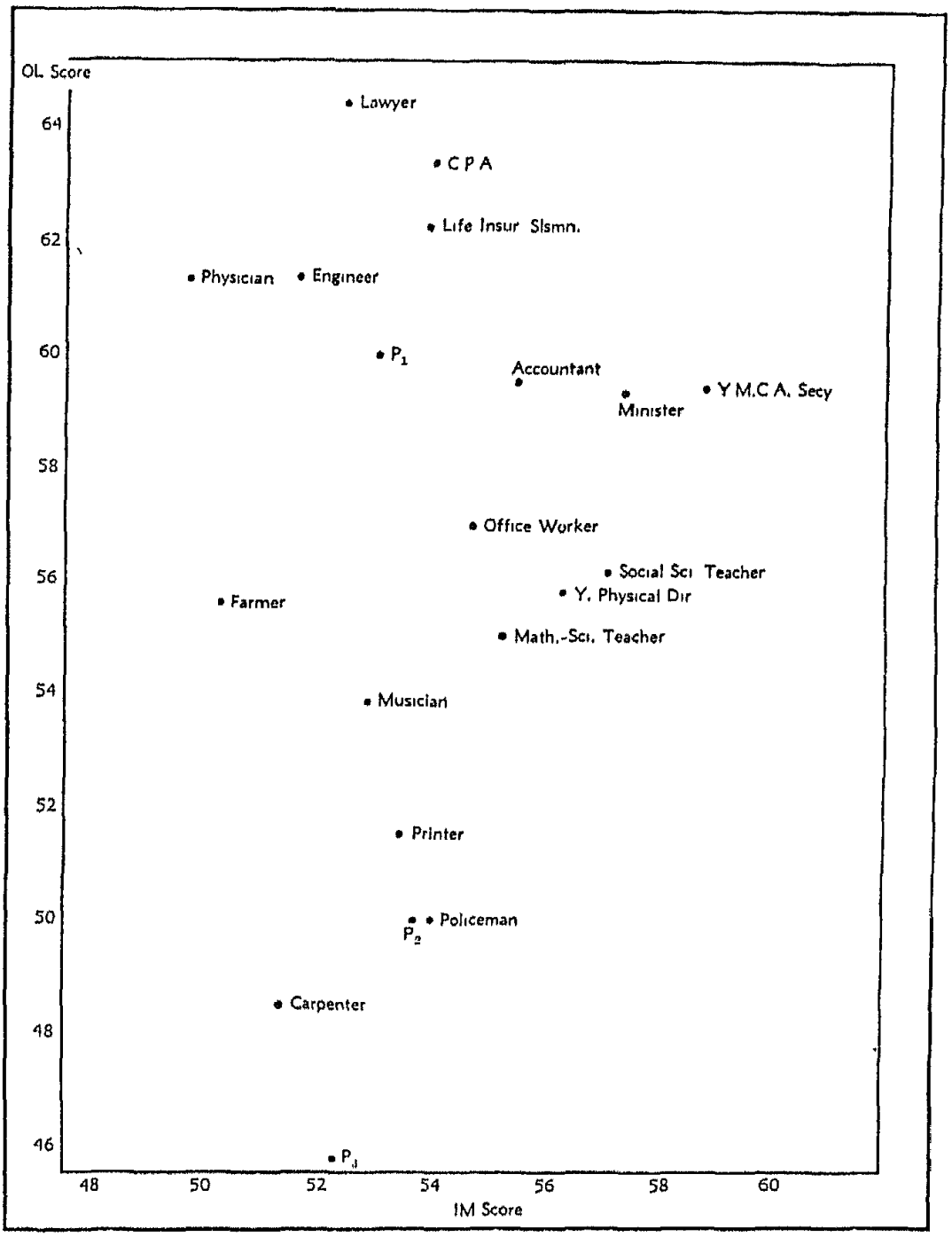


FIG. 48.—Location of P_1, P_2, P_3, and occupations listed in Tables 139 and 142 in terms of standard scores on OL and IM scales.

away from P_2 than from P_1. The correspondence between the two measures of "distance" given in columns four and nine is striking; the rank order correlation amounting to .985.

TABLE 141

"DISTANCE" OF SEVERAL OCCUPATIONS FROM P_1 AND P_2 IN TERMS (1) OF OL STANDARD SCORES AND (2) OF PERCENTAGE DIFFERENCE IN RESPONSES TO 400 ITEMS BY OCCUPATION AND P_1, ALSO P_2

Category or Occupation	OL Standard Score	Difference between Occupation and P's		Difference between Columns 2 and 3[a]	Percentage Difference in Responses to Items of Occupation and P's				Difference between Columns 5 and 7[a]
					P_2		P_1		
		P_2	P_1		Difference	σ	Difference	σ	
	1	2	3	4	5	6	7	8	9
P_2	50.0	....	....	....	....	....	....	....	...
P_1	60.0	....	....	....	....	....	....	....	...
Lawyer	64.4	14.4	4.4	10.0	15.0	10.1	9.3	7.4	5.7
C.P.A.	63.4	13.4	3.4	10.0	12.9	9.5	8.2	7.5	4.7
Minister	58.8	8.8	—1.2	7.6	15.6	11.1	14.2	10.8	1.4
Office man	57.0	7.0	—3.0	4.0	9.1	6.4	7.9	6.2	1.2
Y.M.C.A. physical director	55.8	5.8	—4.2	1.6	11.9	9.7	11.8	10.2	0.1
Farmer	55.7	5.7	—4.3	1.4	9.3	6.3	8.2	6.6	1.1
Musician	53.8	3.8	—6.2	—2.4	10.2	7.9	10.4	8.8	—0.2
Printer	51.5	1.5	—8.5	—7.0	7.8	6.1	10.0	7.7	—2.2
Policeman	50.0	0.0	—10.0	—10.0	9.2	7.1	12.7	9.3	—3.5
Carpenter	48.5	—1.5	—11.5	—10.0	8.5	6.9	12.3	9.4	—3.8

[a] Columns 4 and 9 indicate, respectively, how much farther the occupation is from P_2 than from P_1. *Minus sign in this column indicates occupation differs more from P_1 than from P_2.*

On the basis of this table we can say that the occupations differ in their responses from those of P_1 and P_2 in approximately the proportions given in Figure 48; and this means that P_2 is farther away from the cluster of occupations in Table 139 than is P_1.

Will these three hypotheses hold true regarding occupations which cluster about P_2? Unfortunately we possess at the present time data concerning only four occupations which cluster about P_2. Correlations between these four occupations according as P_1, P_2, or P_3 is used are given in Table 142. Here the correlations based on P_2 approximate zero as our first hypothesis would sug-

gest, the correlations based on P_3 are slightly higher, and those based on P_1 still higher (more positive), just as the second hypothesis would maintain—since P_3 is only 4 standard scores on the OL scale removed from P_2, whereas P_1 is 10 standard scores away.

TABLE 142

CORRELATIONS BETWEEN OCCUPATIONS WHICH CLUSTER ABOUT P_2, ACCORDING TO THE MEN-IN-GENERAL GROUPS USED IN CONSTRUCTION OF THE THREE SETS OF SCALES

Occupational Group	Revised Men-in-General Group P_1	1,000 Men-in-General Group P_2	Skilled, Semi-skilled, Unskilled Men-in-General Group P_3
Carpenter and Policeman	.69	.26	.03
Carpenter and Printer	.73	.24	.10
Carpenter and Musician	.14	−.24	.21
Policeman and Printer	.59	−.27	−.17
Policeman and Musician	.09	−.45	−.20
Printer and Musician	.53	.59	.67
Average	.46	.02	.11

Relationships between occupations unchanged.—It is perfectly obvious that three different sets of correlations can be obtained from the "occupations" *A* to *H* in Figure 47, as given in Table 140. Analogously we can say that the last three sets of correlations in Table 139 can be obtained from the occupations, shown in Figure 48, without the occupations themselves shifting places. The situation is analogous to that of three cities which can retain their positions on the surface of the sphere but be located by different systems of latitude and longitude.

The impression is given in tables 139, 140, and 142 that correlations between two occupations will change appreciably when P_1-, P_2-, and P_3-scales are used. Actually all manner of combinations of correlations may be obtained. For example, when two occupations are about equally distant from the three points of reference the correlations between the two occupations will be quite similar for all three P's. Thus engineer and carpenter corre-

late .69 with P_1 scales, .68 with P_2 scales, and .70 with P_3 scales. If cosines of the central angles subtending carpenter and engineer with P_1, P_2, and P_3, successively, as the central point of the three angles are calculated, we obtain from Figure 48 these statistics:

Engineer vs. Carpenter

On P_1 scales	the cosine (correlation) of	−.60
On P_2 scales	the cosine (correlation) of	−.54
On P_3 scales	the cosine (correlation) of	.96

Here engineer and carpenter are not equally distant from P_1, P_2, and P_3. But if engineer, carpenter, P_1, P_2, and P_3 are plotted in terms of OL and MF standard scores (see Table 87),[4] then the statistics are:

Engineer vs. Carpenter

On P_1 scales	the cosine (correlation) of	.68
On P_2 scales	the cosine (correlation) of	.69
On P_3 scales	the cosine (correlation) of	.83

Here engineer and carpenter differ about as much from the three P's in terms of MF as P_1 differs from P_3 in terms of OL and the combined "distances" of engineer and carpenter from each of the three P's is about equal. (The three correlations just given agree very closely with those obtained by correlating actual scores on these two occupational scales.) It is possible, then, for two occupations to have the same correlations between them even when pairs of scales are based on three different points of reference. But, as far as we have analyzed the situation, it appears that this will occur only when both occupations have quite high loadings on another co-ordinate than the one in terms of which the three P's are delineated.

This evidence in support of our hypotheses is not mathematically complete for lack of sufficient data. There has been no attempt to establish exact relationships in what has gone before but merely to substantiate in general our three hypotheses. Because of this and because it was shown in chapter 14 that the same classi-

[4] The standard OL and MF scores of P_1 are 60 and 46; of P_2, 50 and 47.8; of P_3, 45.7 and 48.4; of carpenter, 48.5 and 58.6; and of engineer, 61.4 and 61.9.

fication of occupations results from both these sets of co-ordinates, it seems permissible to calculate correlations on the basis of cosines of angles when the occupations and P's are located in terms of standard scores instead of factor loadings. Furthermore, it seems permissible to use dimensions of interest determined by factor analysis of P_1 scales with respect to P_2 and P_3, since it is shown in the next chapter that approximately the same classification of occupations results from factor analysis of scales based on P_2 as on P_1 and we believe that this would also be true of scales based on P_3.

Summary.—The answer to the question, "Why do the correlations in the four columns of Table 139 differ?" is that through the use of four different men-in-general groups four different "measuring sticks" have been used for measuring the relationships. The correlations in the table express jointly the relationships among the occupations themselves and the relationships between the occupations and the men-in-general groups. With P_1 scales the correlations express relationships between occupations when they are viewed from the point of reference of the upper socio-economic levels; with P_2 scales the correlations express relationships between occupations when they are viewed from the point of reference of all occupations.

APPLICATION

We have here statistical confirmation of the fact that similarity is a relative matter. When two items among a small homogeneous group are compared, they are seen as more clearly different than if they are members of a larger, heterogeneous group. On the average professions will correlate about zero when they are contrasted with other professions, but they will correlate on the average quite high when they are contrasted with semiskilled trades.

The general conclusion accepted by many that probably skilled workmen and certainly semiskilled tradesmen cannot be differentiated in terms of their interests has resulted from comparing such trades from the point of view of the higher socio-economic level. A similar conclusion would probably have been reached concerning the professions if research had been started at the lower strata.

Certain evidence in chapter 22 will make clear that skilled

tradesmen can be differentiated in terms of their interests providing scales are used based upon P_2 instead of P_1. How far such differentiation can go remains to be seen. The further problem remains to be tackled as to whether or not such differentiation is possible among semiskilled and even unskilled workmen, where possibly scales will need to be built in terms of P_3.

It is generally assumed that lower-level semiskilled and unskilled jobs "demand little in the way of differential abilities or aptitudes." The data we have compiled imply that this is not necessarily true with respect to interests. But we cannot be sure until this area has been well explored. It is also possible that "some specific occupations would be so much a cross section of 'workers-in-general' that their interests could not be differentiated from the interests of the 'worker-in-general' group."[5]

ARE DIFFERENT INTEREST BLANKS AND SCALES NEEDED FOR THE TWO SEXES?

The early work of Manson and the Minnesota Group indicated that occupational differentiation of women on the basis of interests would be less effective than that of men. It was felt that women might not possess interests which would pertain to any large degree to occupations and, second, that even if they possessed such interests to as great a degree as men it would not be statistically as easy to identify them. The reason is that a considerable minority of women enter an occupation not, as men do, for a career but as a stopgap until marriage. Any sample of women would be distorted by the presence of this minority who did not belong as far as their interests were concerned. Our experience justifies our early belief that it is less easy to obtain a good sample of women than of men in other than professional pursuits. But this is a sampling problem that can be overcome if funds are available. Accordingly when we tackled the problem of women's occupational interests we did so with misgivings and concentrated upon the development of scales for professional women, hoping that here at least we could obtain groups of women who truly choose their occupation.

[5] J. G. Darley, *Clinical Aspects and Interpretation of the Strong Vocational Interest Blank* (Psychological Corporation, 1941), pp. 69–70.

So far it appears that the men's scales are more useful than the women's. But there are not yet a sufficient number of occupational scales for women to decide the issue.[6]

The question still remains: Shall men and women be scored on the same or on different scales? Practically the question is: Shall women be scored on the men's scales (since men's scales were developed first)?

To score women on the men's scales implies that: (1) the interests of the two sexes are much alike, (2) the interests of men and women in the same occupation are very much alike, (3) the differences in interests between men engaged in an occupation and men-in-general are essentially the same differences as between women engaged in the occupation and men-in-general. Even after we knew that the likes of males and females correlated in the neighborhood of .71 (Table 10, p. 92), we could not assume that the interests of the two sexes were sufficiently alike to score women on the men's scales, because the likes of most occupations, which have been differentiated by men's scales, correlate higher than .70 with one another (Table 11, p. 94).

The problem here is similar to that in the first part of this chapter, except that now we are concerned with the MF co-ordinate instead of the OL co-ordinate. Men and women are apparently separated farther on the MF co-ordinate than professional and unskilled men are on the OL co-ordinate.[7] It would seem consequently that men's and women's scales should be developed from points of reference which typify, respectively, men and women, and not from any single point of reference.

In order to throw light on this situation, 12 special scales were constructed. These scales were based upon the 250 items common to the men's and women's blanks, thus freeing the resulting comparisons from those complications which arise when different items are included. Two scales resulted for artist—one based upon the weights already established for the men's scale, the other

[6] We shall know more about this subject after the present revision of the women's blank is completed, particularly as the criterion groups, upon which the scales are based, will be increased very considerably in size.

[7] In terms of percentage difference in responses, P_1 and P_2 differ by 11.3 and our criterion groups of men and women by 12.7. These measures are comparable to those in the second half of Table 141.

based upon the weights for the women's scale. Similarly there were two scales for physician, lawyer, mathematics-science teacher, Y.M.C.A.-Y.W.C.A. secretary, and life insurance. One hundred blanks of each sex, representing each of the six occupations, were scored on these special scales.[8]

The correlations between scores on the men's and women's scales are given in the last column of Table 143. They range from .27 to .94. There is very high agreement (.94) between the two artist scales, quite high for the mathematics-science teacher scales (.80), somewhat lower for physician scales (.70), Y. secretary scales (.70), and life insurance scales (.58), and quite low for lawyer scales (.27). From these data it would appear that the two artist scales could be used interchangeably and possibly the mathematics-science teacher scales, but certainly not the life insurance or the lawyer scales.

Correlation, however, only reveals the degree of rank-order of scores; it does not disclose the amount of overlapping between distributions. Mean scores are given in Table 143. In order that comparisons can be more easily made between mean scores, the raw scores have been converted into standard scores based upon the data of this particular experiment. Men artists, physicians, lawyers, and mathematics-science teachers score approximately alike whether the men's or the women's scales are used. But men Y.M.C.A. secretaries and life insurance salesmen score appreciably lower on the women's scales than on the men's scales. Likewise women artists and physicians score approximately alike whether the men's or the women's scales are used; and women life insurance saleswomen score nearly alike on the two scales, but women lawyers, mathematics-science teachers and Y.W.C.A. secretaries score appreciably lower on the men's scales than on the women's scales.

When men's scores on the two scales are contrasted—similarly for women—the differences in mean scores are statistically significant in 8 cases among 12. When mean scores of men and women are contrasted, there are statistically significant differences in 6 cases among 12.

[8] Only 77 blanks were scored for life insurance saleswomen.

TABLE 143

MEAN SCORES OF 6 GROUPS OF MEN AND 6 GROUPS OF WOMEN ON 6 MEN'S SCALES AND 6 WOMEN'S SCALES UTILIZING ONLY THE 250 ITEMS COMMON TO THE MEN'S AND WOMEN'S BLANKS

(N = 100 in each group, except Women Life Insurance Saleswomen where there are 77)

Men	Men's Scales		Women's Scales		Differences between Men's Scores on Men's and Women's Scales		Differences between Men and Women on Men's Scales		Correlation between Men's and Women's Scales: Men Scored on Both Scales
	M	σ	M	σ	Difference	C.R.	Difference	C.R.	
Artist	50	10	48.6	10.7	1.4	3.8	0.4	0.3	.94
Physician	50	10	50.7	9.2	—.7	1.0	1.0	0.7	.72
Lawyer	50	10	49.3	8.1	.7	0.6	5.8	4.4	.27
Mathematics-science teacher	50	10	52.2	10.9	—2.2	3.3	9.4	6.7	.80
Y.M.C.A. secretary	50	10	42.5	8.2	7.5	10.1	8.9	6.2	.69
Life insurance salesman	50	10	43.1	11.5	6.9	7.2	3.8	3.0	.61

Women	Men's Scales		Women's Scales		Differences between Women's Scores on Men's and Women's Scales		Differences between Men and Women on Women's Scales		Women Scored on Both Scales
	M	σ	M	σ	Difference	C.R.	Difference	C.R.	
Artist	49.6	9.9	50	10	—.4	1.2	—1.4	1.0	.95
Physician	49.0	10.3	50	10	—1.0	1.2	0.7	0.5	.69
Lawyer	44.2	8.6	50	10	—5.8	5.1	—0.7	0.5	.28
Mathematics-science teacher	40.6	10.0	50	10	—9.4	15.2	2.2	1.5	.81
Y.W.C.A. secretary	41.1	10.2	50	10	—8.9	11.4	—7.5	5.8	.70
Life insurance saleswoman	46.2	7.5	50	10	—3.8	3.9	—6.9	4.3	.56

When the two parts of the table are considered together it appears that: the two artist scales give surprisingly high agreement; the two physician scales give similar mean scores but correlate only .70; the two mathematics-science teacher scales correlate .80, but the mean scores differ significantly in three of the four comparisons; and the three scales of Y.M.C.A. or Y.W.C.A. secretary, life insurance salesperson, and lawyer differ appreciably. All told, the data suggest that it is likely that the men's and

women's scales can be combined in some cases and that they cannot in other cases.

When standard scores are calculated upon the blanks which constitute the criterion group they are spuriously higher than standard scores which are based upon a new sample. The amount of the error is related to the size of the criterion group varying from 5.6 standard score for a criterion group of 100 cases to 0.8 for a criterion group of 400 cases (see Figure 51, p. 646). If these relationships had been known at the time this study was made, the procedure would have been altered to take this situation more fully into account. If, however, the standard scores of 50 in Table 143 are reduced proportionately to the error associated with the size of the criterion group there remain differences of real consequence although slightly smaller in amount. The average of all the 24 differences is reduced from 4.1 to 3.2. But this measure is not so revealing as the range of differences, for the important conclusion from Table 143 is that men and women score approximately alike on some scales and differently on other scales. The range of differences in Table 143 and in the revised data are as follows:

	In Table 143	In Revised Table
Men score higher on own scales than on women's scales	7.5 to −2.2	6.6 to −3.7
Women score higher on own scales than on men's scales	9.4 to 0.4	7.7 to −3.2
Men score higher than women on men's scales	9.4 to 0.4	7.9 to −1.2
Women score higher than men on women's scales	7.5 to −2.2	5.6 to −3.9

The difference of 5.6, for example, is significant, as it represents a shift of about 17 per cent from the range of 45–49 to the range of 40–44, i.e., from a rating of A to a rating of B+.

Seder's research.[9]—Seder considered in her Doctor's thesis this problem whether or not women could be scored on men's blanks. She had 100 women physicians and the same number of

[9] M. A. Seder, "Vocation Interest Patterns of Professional Women" (unpublished Doctoral dissertation, University of Minnesota, 1938); also "The Vocational Interests of Professional Women," *Journal of Applied Psychology*, 1940, **24**, 130–43 and 265–72.

life insurance saleswomen fill out both the men's and the women's blanks. The 200 women were scored on thirty-five scales for men and women. She analyzed the resulting data in four ways as to: (1) number of A, B, and C ratings; (2) correlation between scores; (3) factor analysis; and (4) comparison of weights on men's and women's scales.

TABLE 144

PERCENTAGE OF WOMEN PHYSICIANS AND LIFE INSURANCE SALESWOMEN WHO WERE RATED A AND C ON 7 MEN'S AND WOMEN'S SCALES*

Scales	A Ratings				C Ratings			
	Physicians		Life Insurance		Physicians		Life Insurance	
	Men's Scales	Women's Scales	Men's Scales	Women's Scales	Men's Scales	Women's Scales	Men's Scales	Women's Scales
Dentist	10	32	0	2	25	23	79	70
Physician	62	63	11	3	5	6	72	72
Artist	4	28	1	6	58	37	91	73
Lawyer	23	14	11	23	6	40	14	31
Life insurance salesperson	0	0	44	43	80	91	15	33
Y.M.C.A. and Y.W.C.A. secretary	4	7	11	10	68	67	41	53
Office worker	2	1	4	36	..	..	..	..

* Seder's thesis Table XXII rearranged. A ratings represented scores above —1 Q on unrevised men's scales but scores above — 5 σ on women's scales. Both sets of ratings have been converted by us to the basis of unrevised men's scales. As C ratings represented approximately the same range of scores on both scales, these ratings are given above as in Seder's table.

Seder paired men office clerks with women stenographer-secretaries and men purchasing agents with women office workers. We have paired the two office clerk scales together. She also paired men's teacher and women's teacher scales. The two groups are very different and are not considered by us: the men's scale is based largely on Phi Delta Kappa membership, the women's scale upon high-school teachers.

Her A and C ratings for seven pairs of scales are given in Table 144. Her women physicians scored practically alike on both the men's and the women's physician scales; her insurance women had practically the same number of A ratings but differed in the number of C ratings on the two insurance scales (15 vs. 33 C ratings). She concludes:

These data offer no evidence for important differences between interests of men and women physicians nor between the interests of life insurance salesmen or women. Of course, if other groups were to be tested, marked differences might be found. For these groups of women, however, the men's blank would serve as well as the women's blank.[10]

[10] *Ibid.*, p. 136.

From a guidance point of view there are more differences here than Seder has implied. Three times as many women physicians rate A in dentist on the women's scale as on the men's scale, seven times as many rate A in artist on the women's scale as on the men's scale, and about half as many rate A in lawyer on the women's scale as on the men's scale. There are other differences with respect to A ratings of insurance women, also differences in C ratings in both groups.

TABLE 145

CORRELATIONS BETWEEN OCCUPATIONS OF THE SAME NAME WHICH ARE SCORED ON BOTH THE MEN'S AND WOMEN'S BLANKS, AND THE RELIABILITIES OF THE RESPECTIVE SCALES

(After Seder, 1940, Table 4)

Scale	*r* based on 100 Physicians	*r* based on 100 Insurance Women	Reliability of Women's Scales	Reliability of Men's Scales[a]
Dentist	.50	.60	.78	.84
Physician	.68	.55	.87	.89
Artist	.71	.71	.93	.92
Lawyer	—.03	.06	.81	.88
Life insurance salesperson	.55	.72	.74	.93
Y.M.C.A.–Y.W.C.A. secretary	.80	.76	.88	.90
MF	.77	.57	.74	.93

[a] Reliabilities are from the author's manuals. Reliabilities for the men's scales not included in Seder's tables

Seder's table of correlations between scores on the men's and women's scales is given in Table 145. She writes:

The most striking thing about the data in this table is the consistently good-sized correlations except for those for the lawyer's keys where there is no relationship at all.

Most of the correlations are not "very much lower than the odd-even reliabilities reported for the women's blank." But why not consider the reliabilities for the men's blank, which were available but not used by Seder, and which make the correlations between scales seem proportionately lower!

Knowing that the likes of adult men and women correlate .71 (Table 10, p. 92), it is not particularly surprising to obtain correlations of that amount (mean is .68) between the scales based on men and women representing the same occupation. It must be

remembered, however, that a correlation of .68 has a forecasting efficiency of .27, whereas a correlation of .86 (the average reliability of these scales) has an efficiency of .49. Consequently we cannot as yet content ourselves by saying that because scores on men's and women's scales correlate .68 they represent about the same thing and are interchangeable. Roughly speaking it would appear that twice as great forecasting efficiency is obtainable by using the scales appropriate to the sex in contrast to using the scale appropriate to the opposite sex. Further research is needed here.

The writer has learned from sad experience that two scales can differ very considerably and yet correlate .90 (see, for example, pp. 625 and 639). Consequently the correlations published by Seder cannot be accepted as proof that the men's and women's scales can be used interchangeably.

A factor analysis was made by Seder of the intercorrelations between scores on both the men's and the women's scales. They are quite similar for the two pairs of scales, except for lawyer, where the loadings from the men's and women's scales correlate about zero. (It was pointed out on p. 166 that men and women lawyers were quite different in their interests as indicated by our own factor analysis. This we found also for dentist, whereas in Seder's analysis men and women dentists agree nearly as well as physicians.) Finding no factor showing heavy loadings for the men's keys only or for the women's keys only, Seder concludes:

> There is no evidence here to substantiate the claim that women's interests show different factors from those of men . . . . These data [factor loadings] tend to support the hypothesis that there is no "femininity" factor occurring among the women's keys and no "masculinity" factor occurring among the men's keys.

In the construction of an occupational scale the interests of men-in-general are subtracted from the interests of men engaged in each occupation and consequently purely masculine interests should not appear in men's scales. The same is true of women's scales. The results which Seder reports are what should be expected. If, however, the factor analysis had been based on the original data (the likes, indifferences, and dislikes), their "mas-

culine" and "feminine" interests would presumably have appeared, since we know that there are some real differences in interests between the two sexes.

The real problem here is similar to the problem respecting P_1 and P_2 scales. In the latter case it appears better to differentiate workmen in terms of differences between workmen and to differentiate men in the upper socio-economic levels in terms of differences from an average of all such men. In this way we eliminate to a large degree the OL factor which separates men in the lower socio-economic levels from the higher levels, and force the resulting differentiation to express primarily the other factors which are otherwise dwarfed by the OL factor. Here it has seemed best to subtract out common interests of men at a given level and differentiate these men on the basis of the remaining interest factors; and similarly for women. These two studies support the data in chapter 6 that the interests of men and women are more similar than dissimilar. The two studies suggest that for some occupations men's and women's scales may be used interchangeably. Our data suggest this is true for the artist scale and possibly for the physician scale. So far as the data show it is much better to score a sex on its own scales.[11]

[11] When high-school girls are "tested on the men's blank the girls tend to receive, if anything, fewer high ratings than the boys, ... but when tested on the women's blank the girls tend to receive more high ratings than do boys tested on the men's blank . . . . It is, then, interesting that the men's blank reveals sensible outcomes when used with girls, but it is also important to note the qualifications which must be accepted when one resorts to such procedures." H. D. Carter, K. von F. Taylor, and L. B. Canning, "Vocational Choices and Interest Test Scores of High School Students," *Journal of Psychology* (1941), **11**, 302.

Chapter 22. Differentiation of Skilled Tradesmen—P_2 Scales

The preceding chapter has shown that occupations with low OL scores are not satisfactorily differentiated from one another when such occupational scales are based upon P_1, but better differentiation is secured using P_2 as a point of reference for the scales. This conclusion raises immediately a number of interesting possibilities. Actually how well can the skilled and even the semiskilled trades be differentiated by using P_2, or possibly P_3, as a point of reference? How will scores on these scales compare with scores on P_1 scales? In other words, will a man obtain the same or a different rating in a given occupation depending upon whether a P_1 or a P_2 scale is used? Furthermore, will the classification of occupations based upon P_1 scales apply to occupations scored upon P_2 scales?

No extensive application of the interest test to occupations in the lower socio-economic occupational levels has been made up to the present time. What has been done suggests, however, three hypotheses regarding the differentiation of occupations at the lower levels by means of interest tests. There is, first, the possibility that certain occupations at different levels might possess the same general trend of interests. Thus all sorts of mechanics, both semiskilled and skilled, might conceivably have the same interests as engineers. That is, they might have about the same interest scores but possibly different intelligence-test scores. There is, second, the opposing hypothesis that the rank and file of men cannot be differentiated in terms of interests—that their interests are all about alike and that they all differ from the interests of men in the upper occupational levels. Third, it is possible that mechanics, for example, may not have the interests of engineers and

at the same time may have interests which differentiate them from those in other skilled and semiskilled trades.

Berman, Darley, and Paterson have thrown some light on this problem. They report that the

> "rank and file" in the population are characterized to a greater extent by "clerical interests" than by other types of measured interests. The clerical pattern of interests thus appears to be fairly common in the general population.[1]

This finding is based, however, on a sampling of city population, containing few, if any, farmers and, we judge, relatively more clerical people than a sampling of the country as a whole. Be this as it may, the general conclusion from their data supports the second hypothesis—that the rank and file cannot be differentiated to any great degree.

On the other hand, analysis by them of a number of occupational groups of skilled and unskilled men leads to this statement:

> Machinists, representative of the higher levels of the skilled trades, show significant interests in the scientific professions of chemist, physicist, engineer and architect, and positive though less significant interests in other technical occupations. With reference to social service and commercial and literary interests, however, their patterns are practically undifferentiated from people in general. Mechanics, janitor-engineers, and carpenters show this same trend or constellation of positive interests in technical pursuits, accompanied by insignificant patterns in the other three groups of interest keys. The trend ceases abruptly in the operatives and in the group of farm laborers, who are no different from people in general on any of the keys. Evidently the trades that require greater degrees of skill and technical information are similar to corresponding occupations at the professional level of the occupational scale so far as interests are concerned.[2]

The conclusion from this study is that both hypotheses hold to some extent—the first with the more skilled trades, the second with the less skilled, including routine office clerks. In the words

[1] I. R. Berman, J. G. Darley, and D. G. Paterson, *Vocational Interest Scales* (University of Minnesota Employment Stabilization Research Institute, 1934), Vol. III, No. 5, p. 10.

[2] *Ibid.*, p. 14. Wagon-route salesmen have been differentiated from mechanics by Churchill with an interest scale based on the differential interests of the two groups. The study "demonstrates the possibility of interest testing on the non-professional level of occupations." See R. D. Churchill, "An Interest Test for Route Salesmen and Mechanics," *Journal of Applied Psychology*, 1942, **26**, 669–81.

of these authors, the latter group "show interest patterns undifferentiated from people in general." They continue:

Whether it will be possible to develop vocational interest scoring keys for such groups of the rank and file is an interesting question; of even greater interest would be the nature of the items if special scoring keys for such groups could be produced. Is it possible that routine workers will turn out to be characterized in "indifference," or will they be characterized by definite "likes" toward things such as "detail" and "repetitive activities"?[3]

TWENTY-ONE P_2 SCALES

Twenty-one occupational scales have been prepared, based on the P_2 men-in-general group, which is representative of men in the United States. Ten of these scales were for all occupations falling below 58 standard score on the Occupational Level scale. Nine other scales were prepared to represent occupations within the upper range of scores on the OL scale and at the same time the various groups of occupations not already represented by the first ten scales. These nineteen P_2 scales are listed in Table 146. Two additional scales, based on blanks of (*a*) semiskilled workmen and (*b*) unskilled workmen,[4] were added to them.

The correlations between scores on P_1 and P_2 scales for the same occupations are given in Table 146. In eleven cases the coefficient of correlation is .81 or higher; in six cases, the coefficient is between .60 and .78; and in two cases the coefficient is distinctly low, i.e., .45 for printer and .57 for office man. These coefficients make clear that for some occupations the rank order of P_1 scores will approximate that of the P_2 scales and that for other occupations the P_1 and P_2 rank orders will differ considerably.

Regardless of the point of reference upon which the scales are based, the occupations are all differentiated, statistically speaking. In order to show this most conclusively P_3 scales were developed for the occupations of carpenter, policeman, printer, musician,

[3] *Ibid.*

[4] These last two scales were developed in order to give some representation of occupations with OL scores below 50. They cannot be used in any practical way until it has been demonstrated that all semiskilled, or all unskilled workmen, belong in one group as far as interests are concerned, a hypothesis that the writer does not believe tenable.

mathematics-science teacher and Y.M.C.A. physical director, the six occupations with lowest mean OL scores. One hundred cases from each of these six occupations were scored on the P_1, P_2, and P_3 scales, and critical ratios were calculated between the mean scores. The lowest critical ratio is 3.6, the highest is 35.1, and the average of all is 13.9. The greatest differentiation occurs on the average with P_2 scales, the next best with P_3 scales, and the third best with P_1 scales. Although this is in harmony with the conclusions brought out in the preceding chapter, the point cannot be stressed, since the differences between degrees of differentiation are not significant. But there is no question that occupations are differentiated from one another on all three sets of scales.

TABLE 146

CORRELATION BETWEEN SCORES ON P_1 AND P_2 SCALES, ALSO RELIABILITIES OF THE TWO SETS OF SCALES

(N = 285 blanks of college seniors)

Mean OL Score	Occupation	Correlation between P_1 and P_2 Scales	Reliability of P_1 Scales	Reliability of P_2 Scales
64.4	Lawyer	.94	.884	.909
63.4	C.P.A.	.82	.727	.849
62.3	Life insurance salesman	.91	.932	.922
61.4	Engineer	.87	.885	.917
61.3	Physician	.86	.886	.893
59 5	Accountant	.60	.839	.794
59.4	Y.M C A. secretary	.86	.898	.871
58.8	Minister	.89	.899	.880
57.7	Dentist	.76	.844	.837
57.0	Office man	.57	.876	....
56.4	Forest service	.71	.880	....
56.1	Social science high-school teacher	.83	.885	....
55.8	Y.M.C.A. physical director	.82	.844	....
55.7	Farmer	.64	.885	....
55.0	Mathematics-science high-school teacher	.81	.881	....
53.8	Musician	.73	.874	....
53.5	Aviator[a]	.83	.905	.890
51.5	Printer	.45	.802	....
50.0	Policeman	.78	.831	....
48.5	Carpenter	.86	.901	....

[a] The aviator P_2 scale was developed subsequently to the twenty-one scales.

CLASSIFICATION OF OCCUPATIONS ON BASIS OF P_2 SCALES

The intercorrelations between the twenty-one P_2 scales are given in Table 147. The table is arranged so as to indicate the best possible grouping of occupations. Here, as previously, the criterion for inclusion of occupations in a group is that they must correlate at least .60 with each other. On this basis physician and dentist may be grouped together as with P_1 scales, in Table 29, (p. 136). Similarly, Y.M.C.A. physical director, Y.M.C.A. secretary, minister, and social science teacher constitute a group, as do accountant and office worker. In addition, engineer and carpenter may be grouped, since they correlate .68 with each other. Although engineer and carpenter were not grouped together when P_1 scales were used, they could have been, since the correlation between them was .69. On other grounds it seemed best in chapter 7 to assign engineer to Group II and carpenter to Group IV.

On the other hand, the group composed of C.P.A., lawyer, and life insurance salesman in Table 147 is entirely different from that reported in chapter 8; for there C.P.A. is assigned to Group VII, lawyer to Group X, and life insurance salesman to Group IX; moreover, they could not have been put in the same group since C.P.A. correlated only .57 with lawyer and .19 with life insurance, and lawyer correlated only .47 with life insurance salesman. All three of these occupations have very high mean OL scores, namely, 63 to 64; consequently the correlations between them are raised perceptibly when the scales are based upon P_2 instead of P_1.

In contrasting the grouping of occupations according as P_1 or P_2 scales are used, our chief concern is with Group IV. All the occupations in that group have OL mean scores within the range of 49 to 56. Here we should expect the reverse effect of that noted with C.P.A., lawyer, and life insurance salesman; namely, that the correlations should be less positive when P_2 scales are used. This is what we find, for instead of the average correlation between the members of Group IV amounting to .68, as in Table 29, it now amounts to only .29. Quite evidently these six occupations cannot be grouped together when P_2 scales are used, nor can they be classified with printer, mathematics-science teacher, and policeman.

TABLE 147

CLASSIFICATION OF OCCUPATIONS BASED ON CORRELATIONS BETWEEN P_2 SCALES

(N = 285 blanks of college seniors)

Occupation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 Physician																		
2 Dentist	.93																	
3 Engineer	.62	.63																
4 Carpenter	.19	.32	.68															
5 Farmer	.48	.56	.67	.57														
6 Forest service	.35	.42	.57	.48	.67													
7 Printer	.53	.52	.44	.24	.32	.29												
8 Mathematics-science teacher	.12	.19	.37	.35	.21	.37	.20											
9 Policeman	—.14	—.07	.10	.26	.06	.38	—.27	.21										
10 Y.M.C.A. physical director	—.10	—.13	—.41	—.52	—.49	.01	— 29	.17	.25									
11 Y.M.C.A. secretary	—.25	—.35	—.60	—.75	—.57	—.27	—.33	—.09	—.14	.74								
12 Minister	.23	.12	—.33	—.55	—.41	—.13	.09	.05	—.21	.64	.77							
13 Social-science teacher	— 25	—.34	—.67	—.83	—.55	—.36	— 18	—.15	— 22	.55	.85	.66						
14 Musician	.57	.50	—.01	—.24	—.05	—.06	.59	—.04	—.45	.15	.17	.56	.27					
15 C.P.A.	.45	.30	.25	—.37	.01	—.04	.20	—.11	—.33	.03	.27	.32	.36	.36				
16 Lawyer	.56	.38	.07	—.52	—.01	—.09	.22	—.35	—.62	.13	.33	.48	.46	.54	.85			
17 Life insurance salesman	.06	—.04	—.35	—.70	—.25	—.31	— 29	—.59	—.26	.27	.54	.32	.60	.18	.59	.73		
18 Accountant	—.12	—.17	.05	—.30	—.09	—.11	—.15	.02	—.11	.03	.30	.00	.37	—.16	.69	.36	.44	
19 Office man	—.26	—.28	—.28	—.54	—.30	—.29	—.28	—.23	— 12	.16	.45	.07	.55	—.11	.55	.37	.65	.86

Factor analysis of P_2 scales.—The factor loadings for the twenty-one P_2 scales are given in Table 148. The communality for many of these scales is low.

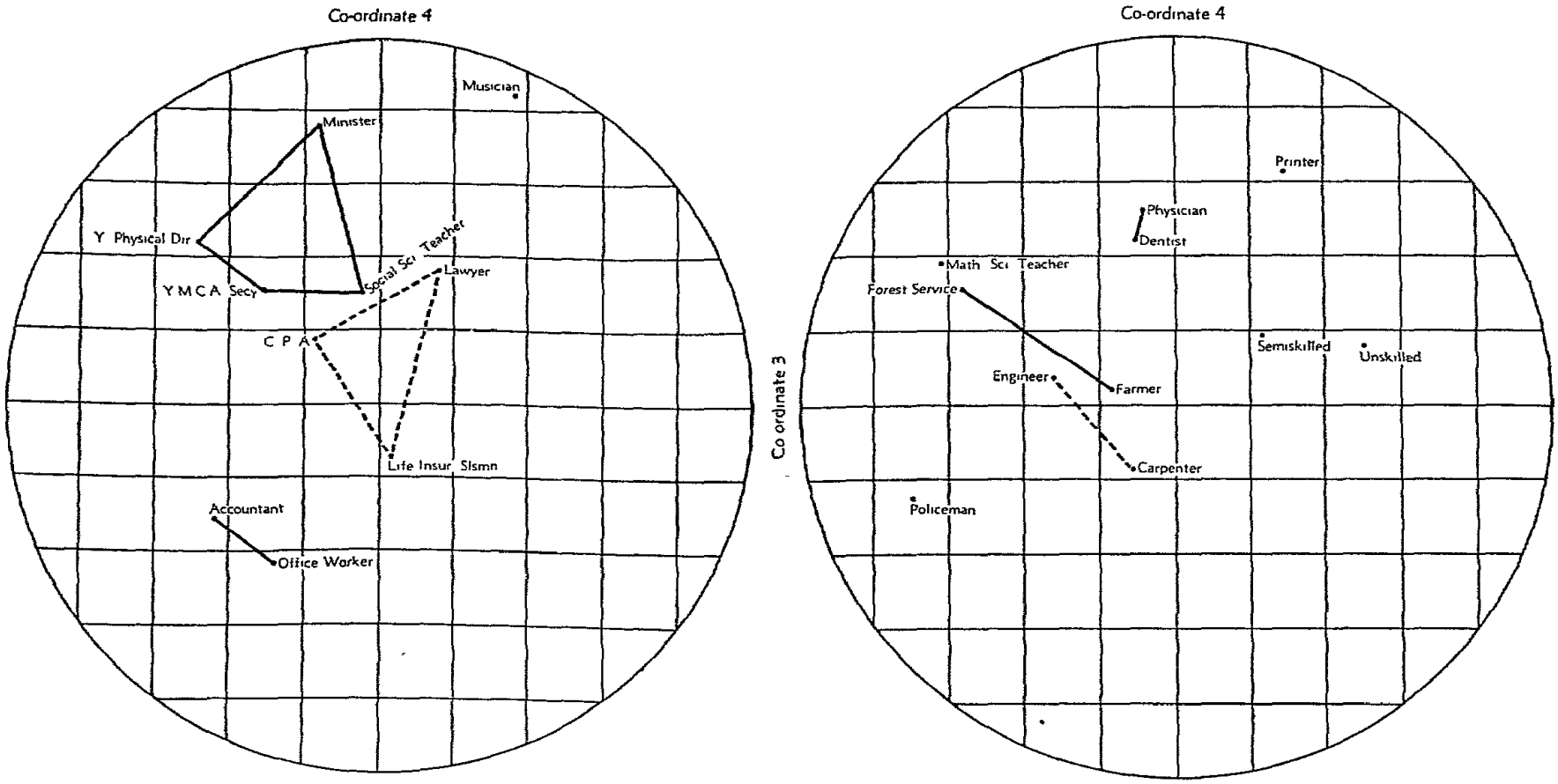
TABLE 148

FACTOR LOADINGS OF TWENTY-ONE P_2 SCALES

Occupation	k_1	k_2	k_3	k_4	k_5	h^2
Physician	—.220	—.707	.525	—.073	—.235	0.884
Dentist	—.345	—.676	.444	—.112	—.240	0.842
Engineer	—.602	—.634	.069	—.281	.116	0.862
Farmer	—.610	—.518	.039	—.141	—.113	0.678
Carpenter	—.872	—.148	—.167	—.114	.069	0.828
Printer	—.318	—.407	.532	.255	.327	0.728
Mathematics-science teacher	—.393	.132	.306	—.493	.374	0.648
Policeman	—.327	.312	—.179	—.500	—.184	0.520
Forest service	—.532	—.206	.238	—.438	—.140	0.594
Y.M.C.A. physical director	.455	.397	.376	—.416	—.236	0.735
Y.M.C.A. secretary	.822	.312	.305	—.300	—.076	0.962
Social-science teacher	.848	.204	.278	—.045	.093	0.849
Minister	.552	.098	.682	—.150	—.118	0.816
Musician	.165	—.282	.696	.303	.025	0.684
C.P.A.	.516	—.698	.161	.168	.230	0.861
Accountant	.514	—.354	—.284	—.394	.456	0.833
Office man	.721	—.251	—.401	—.259	.285	0.892
Life insurance salesman	.813	—.360	—.140	.037	—.344	0.930
Lawyer	.596	—.697	.376	.163	—.128	1.025
Semiskilled	—.410	.679	.172	.209	.241	0.760
Unskilled	—.465	.507	.129	.427	.202	0.713

Figures 49 and 50 present graphically the relationships of the twenty-one occupations to each other in terms of P_2 scales, using here factors 1, 3, and 4 of the factor analysis. Occupations that are grouped together on the basis of both P_1 and P_2 scales are connected by solid lines; occupations grouped differently in the two cases are connected by broken lines, giving the grouping for P_2 scales.

The six occupations originally assigned to Group IV are now scattered widely across the lower surface of the sphere (see Figure 50) in octants 6, 7, and 8; whereas when P_1 scales were analyzed all six fell close together in octant 5 of Figure 6 (p. 146). Similar comparisons, in which other combinations of the five factors are plotted, show the same result, namely, that with P_1 scales the six occupations are closely grouped, whereas with P_2 scales they are not.



FIGS. 49 and 50.—Distribution of occupations on the basis of P_2 scales in terms of co-ordinates 3, 4, and 1 (factor loadings, equalized). Occupations with positive co-ordinates of factor 1 shown in Figure 49; those with negative loadings shown in Figure 50. See text for explanation of solid and dashed connecting lines.

Although occupations with high OL mean scores are located much closer together with P_2 scales than with P_1 scales, and the reverse occurs with occupations with mean OL scores approximating 50, nevertheless the two classifications of occupations based on P_1 and P_2 scales, respectively, are essentially the same.

When occupations are viewed in terms of the average man in the United States, i.e., from the level of P_2 (50 on the OL scale), the six occupations of carpenter, farmer, forest service, printer, mathematics-science high-school teacher, and policeman are significantly different in their interests, so much so as to correlate less than .60 with each other (with the exception of farmer and forest service). When they are viewed, on the other hand, from the level of men earning $2,500 or more a year ($P_1$ level), they appear to be much more alike and actually correlate over .60 with each other in terms of P_1 scales. Group IV as set forth in Table 29 is *proper* from the viewpoint of P_1 but not from that of P_2.

This finding substantiates the hypothesis that occupations among the skilled trades and quite likely among the semiskilled trades will be found to differ very considerably among themselves with respect to their interests. All the conclusions to the contrary reported by us and others have resulted from viewing these occupations from the level of the better-paid business occupations and professions and not from the level of the occupations under consideration. This finding warrants the attempt to develop scales for skilled and semiskilled occupations based upon P_2 with the expectation that such scales may aid young men of that occupational stratum to choose more wisely their life work.

P_3 scales.—Is there a need for a third point of reference? P_2 and P_3 are now so close together (50 and 46 on OL scale) that possibly another point of reference should be set up in the neighborhood of 40 so that P_1, P_2, and a new P_3 would be equally distant, i.e., located, respectively, at 60, 50, and 40 OL scale. From Table 49 (p. 190), it appears that 19 per cent of the male population scores at 40 or below on the OL scales. It is, however, rather doubtful if the sample of our 1,000 men referred to in the table is particularly accurate at the lower levels. Men with too little intelligence or education cannot, or will not, fill out the interest blank, and hence it is very likely that most of these individuals

are unrepresented in our sampling. If this is so, the level of 40 may fall above a sufficiently large percentage of the male population to provide a good point of reference for interest scales of lower-level occupations. There are three considerations to be taken into account. First, how many men actually score below 40 OL? Second, how many of these men can or will fill out an interest blank? The answer to this question must be considered not merely in terms of men today but also of tomorrow, since young people generally are receiving much more education than formerly. Third, are there men with OL scores below 40 who are *successfully* engaged in lower-level occupations? So far occupational scales have been based upon men who were deemed to be satisfactorily employed in their occupation. Can such criterion groups be found with mean OL scores in the neighborhood of 40, or is it possible that successful men in any occupation score so much higher than 40 that scales may as well be developed in terms of P_2 at 50? It is also possible that even if scales of lower-level occupations can all be developed in terms of P_2, men with low OL scores would be better differentiated by using a new P_3, just as men with OL scores of 50 are better differentiated in terms of the higher-level occupations by the present P_2 scales than by the P_1 scales. Speculation is of little avail—only further research will supply the facts necessary for determining the best procedure.

SCORES ON P_1 AND P_2 SCALES CONTRASTED

Although the correlations between scores on P_1 and P_2 occupational scales (Table 146) are fairly high, they are not so high but that considerable variation in scores may not occur in many cases. It is important to note how much variation does occur in using the two sets of scales and to determine the significance of such differences.

Three variables must be kept in mind in the discussion that follows: first, the mean OL score of the occupation; second, the OL score of the man who filled out the *Vocational Interest Blank;* and, third, whether P_1 or P_2 scales are used.

The mean OL score of the occupations.—Our original hypothesis limited the use of P_2 scales to occupations of low OL scores. The dividing point between P_1 and P_2 scales should seem-

ingly be 55 OL, since that is halfway between P_1 and P_2, with OL mean scores of 60 and 50, respectively. Because the Minnesota group had found that the interests of office people were quite similar to the interests of the general population it seemed advisable to include that occupation in the P_2 group, even though its mean OL score was 57.0. On this basis we have divided the thirty-six occupations, for which scales are available, into two groups: the first group consists of twenty-five occupations[5] with mean OL scores above 57.5 and the second group consists of eleven occupations with mean OL scores below 57.5. Members of the second group together with their mean OL scores follow:

Carpenter	48.5	Farmer	55.7
Policeman	50.0	Y.M.C.A. physical director	55.8
Printer	51.5	Social science teacher	56.1
Musician	53.8	Forest service	56.4
Aviator	54.3	Office man	57.0
Mathematics-science teacher	55.0		

Various groups of data have been studied in order to determine the usefulness of a program which would provide P_1 scales for the twenty-five occupations and P_2 scales for the eleven occupations. The first set of data to be considered are given in Table 149 based on the blanks of 119 young men who scored below zero raw score on the OL scale. The blanks were selected by Dr. Darley from among those filled out by freshmen entering the College of Science, Literature, and the Arts of the University of Minnesota in the fall of 1939. Actually the OL scores range from 30 to 47 standard score, the average being 41.7. The 119 cases are divided into three subgroups in terms of their OL scores (see Table 149). The average age of all three subgroups is 18.6 years (62 per cent are 18 years old, and 93 per cent are 17 to 19 years of age).

The first part of Table 149 gives the percentage of A, B+, and B ratings on the twenty-five P_1 occupational scales. All three subgroups score alike on these occupational scales; that is, boys with OL scores between 30 and 39 score in the same manner as boys with OL scores between 45 and 47. So far, norms for P_2 scales of these twenty-five occupations have been determined for

[5] The osteopath scale is included among the twenty-five scales, as the mean OL score of osteopaths is 57.6.

only Y.M.C.A. secretary, minister, and lawyer. Data in the second section of the table indicate that the 119 boys score somewhat lower on the three P_1 scales than on all twenty-five scales, largely because of the minister scale. When P_2 scales for these three occupations are employed (section four of the table) the situation is quite different—only 1 per cent of the 119 boys obtain an A, B+, or B rating instead of 20 per cent when P_1 scales are used. If we accept the three occupations as representative of the twenty-five occupations we can conclude that boys with low OL scores will obtain few significant ratings when P_2 scales are used for occupations of mean OL score above 57.5. Theoretically this is as it should be—men with low OL scores have the interests of lower-

TABLE 149

PERCENTAGE OF SCORES RATED A, B+, AND B OF 119 STUDENTS WITH LOW OL SCORES, ACCORDING AS THEY ARE SCORED (*a*) ON P_1 OR P_2 SCALES AND (*b*) ON OCCUPATIONAL SCALES WITH MEAN OL SCORES ABOVE OR BELOW 57.5

Ratings	P_1 Scales of 25 Occupations with Mean OL Scores above 57.5			P_1 Scales of 3 of the 25 Occupations			P_1 Scales of 11 Occupations with Mean OL Scores below 57.5		
	OL Scores 30–39 N = 24	OL Scores 40–44 N = 73	OL Scores 45–47 N = 22	OL Scores 30–39 N = 24	OL Scores 40–44 N = 73	OL Scores 45–47 N = 22	OL Scores 30–39 N = 24	OL Scores 40–44 N = 73	OL Scores 45–47 N = 22
A	6	7	7	4	8	3	58	40	29
B+	7	7	7	7	5	2	17	19	18
B	10	11	12	7	10	9	14	16	22
Total	23	25	26	18	23	14	89	75	69
Summary[a]	25			20			78		

Ratings	P_2 Scales of the 3 Occupations			P_2 Scales of the 11 Occupations		
A	0	0	0	3	3	4
B+	0	0	3	4	7	6
B	0	1	0	10	12	13
Total	0	1	3	17	22	23
Summary[a]	1			21		

[a] Summary of A, B+, and B ratings of the three subgroups.

level occupations and should not score high on occupations in the upper levels.

The data in the third part of the table, obtained with the use of P_1 scales of occupations with low OL scores, are very different from the data in the first part of the table. The 119 boys have A, B+, and B ratings on 78 per cent of the 11 scales in contrast to 25 per cent on the 25 scales. If A ratings alone are considered, the ratio is 42 to 7—a very great difference. Evidently boys with low OL scores obtain most of their high occupational ratings on occupations with low OL mean scores.

The OL score of the man.—Comparison of the data in the third and fifth parts of Table 149 brings us to the primary consideration of this section. These boys obtain an A, B+, or B rating on 78 per cent of the eleven occupations when P_1 scales are employed but on only 21 per cent of these occupations when P_2 scales are used. When only A ratings are considered, the ratio is 42 to 3! Whether P_1 or P_2 scales are utilized will have a distinct effect upon the resulting counseling. The question is: Which set of scales is the more useful with boys of low OL score? Certain relationships need to be considered before attempting to answer this question.

As an introduction to the next section we may note that the difference in P_1 and P_2 scores varies with the OL score of the man. The lower his score, the greater is the difference. The ratio between A ratings on P_1 and P_2 scales is 58 to 3 for boys with OL scores between 30 and 39; the ratio decreases to 40 to 3 for boys with OL scores of 40 to 44, and to 29 to 4 for boys with OL scores of 45 to 47.

Relationship of the OL score of the man to his P_1 and P_2 scores.—The discussion which follows is restricted to ten occupations with low OL mean score, the aviator scale not having been developed when most of the data, referred to below, were calculated. In addition to data from the 119 cases furnished by Darley, data are considered from four other groups of subjects. First, carpenters scored on P_1 and P_2 carpenter scales (data on policemen, printers, and musicians scored on their respective scales are considered here but not published). Second, college seniors scored on P_1 and P_2 carpenter scales (data on this group scored on policeman, printer, and musician scales are also considered

but not published). Third, C.C.C. boys scored on both P_1 and P_2 scales of the ten occupations listed above. This group is used because it contains more cases with low OL scores than any other in our files. And, fourth, 32 high school–junior college students, who scored between 34 and 44 OL, with a mean of 40. These cases were all that scored below 45 OL among 160 men. (All but one of the 32 cases had MF scores of 50 or higher, the mean MF score for the group being 58.) In each of the following tables the members are distributed according to their OL score and the mean P_1 and P_2 scores on a given occupational scale are contrasted for each OL subgroup.

Three relationships are evident: First, P_1 scores are more greatly influenced than P_2 scores by the OL score of the man tested. We have already seen that this is true in the case of the 119 boys. It is also shown in Table 150 for carpenters and college seniors

TABLE 150

CARPENTERS AND COLLEGE SENIORS SCORED ON P_1 AND P_2 CARPENTER SCALES

(Cases distributed according to their OL scores in order to show the relationship between OL score and P_1 and P_2 carpenter scores)

	Carpenters					College Seniors				
OL Scores	N	P_1 Scale	P_2 Scale	Difference	A.D.	N	P_1 Scale	P_2 Scale	Difference	A.D.
69.....	2	23.0	42.0	—19.0	19.0	4	—3.0	12.0	—15.0	15.0
63.....	3	33.3	51.3	—18.0	18.0	14	5.5	16.2	—10.7	12.0
57.....	9	41.3	54.1	—12.8	12.8	40	12.1	16.0	—3.9	4.5
51.....	22	46.4	52.8	—6.4	6.7	26	26.1	27.0	—1.0	3.6
45.....	29	51.6	51.0	0.5	4.0	13	29.2	23.1	6.1	6.1
39.....	25	56.3	47.0	9.4	9.4	3	34.7	21.0	13.7	13.7
33.....	6	59.3	45.7	13.7	13.7	..	....	....	....	....
27.....	4	60.5	41.8	18.8	18.8	..	....	....	....	....
Total..	100	50.4	49.8	0.6	8.6	100	17.1	19.8	—2.7	6.2

when scored on the P_1 and P_2 carpenter scales. With carpenters the P_1 scores vary from 23 to 61, but only from 42 to 54 on the P_2 scales. With college seniors the P_1 scores vary from —3 to 35 and with P_2 scores from 12 to 27. The same conclusion holds for the scores of C.C.C. boys—the averages of ten sets of scales give a range from 10 to 52 for P_1 scales and from 19 to 25 for P_2 scales (Table 151).

TABLE 151

MEAN SCORES ON P_1 AND P_2 SCALES OF 96 C.C.C. BOYS, DISTRIBUTED ACCORDING TO OL SCORES OF THE BOYS

OL Score	N	Carpenter		Police		Printer		Musician		Math-Science Teacher		Farmer		Y.M.C.A. Physical Director		Social-Science Teacher		Forest Service		Office Man		Means		Differences
		P_1	P_2	P_1	P_2	P_1	P_2	P_1	P_2	P_1	P_2	P_1	P_2	P_1	P_2	P_1	P_2	P_1	P_2	P_1	P_2	P_1	P_2	P_1-P_2
65	1	2	18	5	7	21	52	41	61	2	0	21	41	—1	1	8	24	—10	8	10	33	10	25	—15
60	10	17	25	22	21	27	39	29	42	16	8	30	39	4	3	14	17	8	14	24	31	19	24	—5
55	16	24	29	25	22	33	40	35	42	22	11	31	36	13	2	18	17	13	13	27	28	24	24	0
50	12	35	35	39	33	39	38	30	33	26	10	39	37	22	8	20	14	26	21	31	24	31	25	6
45	23	36	31	38	28	42	34	33	32	30	9	42	35	24	5	23	12	27	14	33	19	33	22	11
40	19	42	31	44	31	48	33	38	31	39	17	45	32	31	9	32	16	34	15	40	21	39	24	15
35	12	46	30	48	33	53	32	36	26	37	10	46	28	33	7	28	8	31	6	41	17	40	20	20
30	2	42	19	46	24	56	26	52	33	46	15	56	33	40	11	42	19	38	8	38	5	46	19	27
25	1	61	35	53	25	66	32	53	29	60	29	66	35	35	—4	40	8	46	7	42	1	52	20	32

Second, P_1 scores on the ten occupational scales vary inversely with the OL score of the man tested. Carpenters with very low OL scores average 60.5 on the carpenter scale; as their OL score increases their carpenter score decreases to 23 (see Table 150). College seniors all score low on the carpenter scale; but here again the higher their OL score the lower their P_1 carpenter score. The same is true for 96 C.C.C. boys on ten P_1 scales, with the possible exception of the musician scale, where the trend is not established by our data (Table 151).

Third, P_2 scores on the ten scales are at a maximum when the OL score of the man tested is in the range of 50 to 60. Such P_2 scores decrease in size as the man's OL score deviates from this optimum range. In the case of the carpenter scale the optimum range is 57 to 62 OL for carpenters and 51 to 56 for college seniors and C.C.C. boys. The optimum range varies somewhat on different scales and with different groups of individuals. The data with C.C.C. boys indicate, however, that P_2 scores increase as the man's OL score increases on the printer, musician, farmer, and office-man scales. Presumably the reverse is the case on the mathematics-science-teacher and physical-director scales. Averages for all ten scales, on which the C.C.C. boys are scored, show no variation in P_2 score over the OL range of 40 to 65. This conclusion holds, however, for 16 of the 22 sets of data which have been considered by us.

USE OF P_2 SCALES

Use of P_2 scales instead of P_1 scales may be considered in terms, first, of who is being tested and, second, on what scales.

Which men to be scored on P_1 and P_2 scales.—The best answer to this query at the present time is that men should be scored on scales which are based upon a point of reference at about the level to which the man, himself, belongs. In terms of the man's score on the OL scale, men with OL scores of 60 or higher should certainly be scored on P_1 scales; men with intermediate scores, i.e., 45 to 60, may be scored on either P_1 or P_2 scales, but preferably on the former; and men with OL scores of 44 and below should be scored on P_2 scales.

The significance of all this may be made clear by expressing it in terms of everyday vocational guidance, as follows: College men of superior attainments should be advised to consider the professional and administrative positions in business and government, whereas high-school boys of inferior attainment should be directed into the skilled trades, and not vice versa.

Data supporting this conclusion follow.

a) Men with OL scores of 60 and higher.—The preceding tables show that P_2 scores are distinctly higher than P_1 scores on the ten occupations with low mean OL score. But from a diagnostic point of view there is surprising agreement—that is, the occupation with the highest P_1 score is also in most cases the occupation with the highest, or second highest, P_2 score. Table 152 shows 83 to 86 per cent complete agreement between the highest P_1 score and the highest P_2 score in the range of 60 to 64 OL score. Above that range our data are too meager to establish what the relationship is, but they suggest that the agreement is far less than with somewhat lower OL scores. Such lower agreement with very high OL scores is, however, of little consequence; for there is very little likelihood that men with such OL scores would be interested enough in any of the ten occupations to warrant scoring for them on either P_1 or P_2 scales.

b) Men with OL scores of 45 to 60.—P_1 and P_2 occupational scores on the ten scales agree quite well when the individual's OL score is in the range of 45 to 60 and the two disagree more and more as the OL score deviates from this range. In the case of carpenters scored on the two carpenter scales the agreement is better at the 45–50 OL range than at the 51–56 range, but the reverse holds with college seniors (Table 150). For the C.C.C. boys the optimum range varies somewhat with the ten scales, but the average for all ten scales is the range of 55 to 60 OL. Apparently either set of scales may be used in this situation.

When the highest P_1 score is compared with the highest P_2 score in the range of 45–60 OL scores, we find 82 per cent agreement among college seniors and 71 per cent agreement among C.C.C. boys (see Table 152). If second choice as well as first choice is considered there is 100 per cent agreement among seniors and 89 per cent agreement among C.C.C. boys. Since occupa-

tional diagnosis should consider the second as well as the highest occupational rating, there would be slight chance of a fundamentally different diagnosis based on P_1 and P_2 scales when the man's OL score is in the mid-range of 45 to 60. Evidently under these conditions it makes little or no difference which set of scales is used.

TABLE 152

EXTENT TO WHICH THE HIGHEST SCORE ON P_1 SCALES AGREES WITH THE HIGHEST SCORE ON P_2 SCALES*

(Figures in percentages)

OL Scores	50 College Seniors				50 C.C.C. Boys			
	N	Complete Agreement	Highest P_1 Score in Same Occupation as the Second Highest P_2 Score	Total	N	Complete Agreement	Highest P_1 Score in Same Occupation as the Second Highest P_2 Score	Total
70	3	33	...	33	..	...	...	...
65	4	25	...	25	..	...	...	...
60	14	86	7	93	6	83	...	83
55	15	93	7	100	11	64	18	84
50	11	64	36	100	2	100	...	100
45	2	100	...	100	11	73	18	91
40	1	0	100	100	12	58	...	58
35	..	...	...	...	6	33	17	50
30	..	...	...	...	2	100	...	100
Total	50	74	14	88	50	66	10	76

* The ten occupations considered here are listed in Table 51.

Since there are more P_1 than P_2 scales available today, the practical answer is that all men with OL scores of 45 and higher should be scored on P_1 scales. This will take care of about 70 per cent of the men; for Table 49 (p. 190) indicates that only about 30 per cent of our sample of the general adult male population score below 45 OL. As the data in Table 55 (p. 198) suggest that there is a slight rise in OL score with age from 15 to 25 years, probably more than 30 per cent of young men would score below 45 OL.

c) *Men with OL scores of 44 and below.*—P_1 and P_2 scores differ considerably here, the former being higher than the latter (see Tables 150 and 151). When the highest P_1 and P_2 scores

are compared, we find only 55 per cent agreement for C.C.C. boys (Table 152). When second choices also are considered, the agreement is raised to 60 per cent. Less agreement is found with the 32 high school–junior college students; in only 13 per cent of cases do the highest scores on both scales agree. This percentage is raised to 28 per cent when agreement is defined as belonging to the same occupational group. In half or more of the cases a different diagnosis will result from the use of P_1 and P_2 scales when the man's OL score is below 45. On the other hand, surprising agreement exists between the highest P_1 and P_2 scores of the Darley cases. Here fourteen pairs of occupational scales were employed—the eleven listed on page 587 and the three additional scales of Y.M.C.A. secretary, minister, and lawyer. Analysis of the data show a 76 per cent agreement between the highest P_1 and highest P_2 occupational scores. When the highest and second highest P_2 scores are included in the comparison the agreement rises to 90 per cent.[6] No explanation occurs to us for the surprising differences in results among the three groups of young men.

Which are more significant, P_1 or P_2 scales?—The question remains: Which are more significant, P_1 or P_2 occupational scores, when a man's OL score is below 45? By significant we mean which set of scores gives the best diagnosis of the man's interests, and which set agrees best with the occupation-engaged-in years later?

Up to the present time there has been no opportunity to follow up cases which belong in this low OL range. The occupational scores on both sets of scales for our college seniors have been compared with their occupational careers ten years later. In this case the rank-order of the occupational scores most appropriate to the occupation-engaged-in has been noted, first, using only P_1 scales and, second, substituting P_2 scales for P_1 scales as far as possible. There is a trifle better agreement in the first case. But this analysis does not really answer the question, because P_2 scales are designed for use with men who have low OL scores, whereas nearly all the Stanford seniors have OL scores above 45 and most of them have such scores above 50.

[6] Despite this agreement in rank-order, radically different conclusions would be reached as to which occupation a man should enter, since few P_2 scores are A or B+ ratings and 60 per cent of P_1 scores are such ratings (see Table 149).

The P_1 and P_2 scores of our high school–junior college group differ greatly and lead to quite different interpretation of the scores in the majority of cases. The percentages of these boys who rate A, B+, and B on ten P_2 scales and on 34 P_1 scales are given in Table 153. The occupations are listed in rank-order taking into account both the OL and MF mean scores of the occupations. (The boys, it will be remembered, average 40 OL and exceptionally high in MF, i.e., 58). Occupations with low OL and high MF appear at the top of the table and those with high OL and low MF at the bottom.[7] The table indicates that the students' occupational scores are a reflection of their low OL and high MF scores, since they score lower and lower on the occupations as listed in the table. P_1 scores appear to reflect most strikingly the influence of the OL factor and apparently also the MF factor, whereas P_2 scores are much freer of these influences.

Fifty per cent or more of the students score high on a third of the 34 P_1 scales; on the other hand, only about one-third score high on four of the ten P_2 scales.[8] The latter data seem more reasonable than the former. Moreover, high P_1 scores are found not only in Occupational Groups II, III, and IV, which might be expected, but also in Groups V and VIII; whereas high P_2 scores are restricted to Group IV. Since it is difficult to believe that boys with low OL scores should rate high on so many scales, some of which belong to a higher occupational level than the boy occupies, it appears that P_1 scales which give such results should not be employed in this situation.

Can P_1 and P_2 scores be used in the same profile?—Comparison of P_1 and P_2 scales when used with men of low OL scores has demonstrated two things: first, P_1 scores average higher than P_2 scores; and, second, there is high agreement in rank-order of such scores, particularly with respect to the highest P_1 and P_2 scores. Despite this agreement in rank-order, radically different interpretations of profiles containing both P_1 and P_2 scores will be reached, because the P_1 scores are often B, B+, and A ratings and the P_2

[7] Double weight is given OL scores here, since it appears that the greater range of MF scores is an artifact and that two MF standard scores are equal approximately to one OL standard score (see page 330).

[8] These relationships are quite similar to those of the Darley cases (see Table 149, p. 588).

TABLE 153

PERCENTAGE OF 32 HIGH SCHOOL–JUNIOR COLLEGE STUDENTS WHO RATED A, B+, AND B ON 34 OCCUPATIONS, ACCORDING AS P_1 OR P_2 SCALES ARE USED

Occupational Scale[a]	34 P_1 Scales	10 P_2 Scales
Carpenter	91	44
Policeman	100	50
Mean	95.5	47
Printer	100	53
Engineer	63	0
Mathematics-science teacher	97	0
Forest service	72	3
Mean	83	19
Production manager	81	0
Farmer	97	38
Office man	81	9
Dentist	38	0
Chemist	47	0
Purchasing agent	56	0
Y.M.C.A. physical director	47	6
Musician	66	6
Banker	56	0
Social-science teacher	44	6
Accountant	63	0
Mean	56	13
Personnel manager	31	
Realtor	34	
Sales manager	6	
President	0	
Physician	13	
Mathematician	0	
Architect	6	
Y.M.C.A. secretary	9	
C.P.A.	0	
Mean	12	
City school superintendent	3	
Lawyer	0	
Life insurance salesman	3	
Minister	3	
Psychologist	3	
Artist	0	
Advertising man	3	
Journalist	0	
Mean	2	

[a] Occupations are listed in order from low to high OL mean score and from high to low MF mean score, since the boys average 39.7 OL and 57.5 MF. Double weight is given OL (see footnote 7).

scores are seldom high ratings. In other words, if some low-level occupations are scored on P_1 scales and some on P_2 scales, the former will receive in general so much higher ratings than the latter that the P_2 scale scores will usually be ignored.

Our plan had been to score blanks of men with low OL scores on P_2 scales for the ten low OL occupations and to use P_1 scales for the remaining occupations whenever that seemed desirable. But the same relationship holds here as described above, i.e., P_2 scores average so low when compared with P_1 scores that the former are seldom considered when both P_1 and P_2 scores are used together. Take, for example, the 149 cases of C.C.C. boys, junior college students, and Darley's college freshmen who have OL scores below 40. When P_1 scales are used exclusively, 95 per cent of the "highest" ratings are found among the ten occupations. But this percentage is reduced to 27 when the ten occupations are scored on P_2 scales and the remaining on P_1 scales.[9] These data indicate the inadvisability of using an occupational-interest profile which includes both P_1 and P_2 scores.

Which occupations to be scored on P_1 and P_2 scales.—The above data show that if men with low OL scores are scored on P_1 scales they obtain some significant ratings on most of the scales. Since P_2 scales and norms have not been developed for most occupations with mean OL scores of 57 and above, we do not know whether or not such men would obtain significant ratings on all possible P_2 scales. Until experimentation has determined the matter it may be assumed that P_2 scales for most occupations will be useful.

In terms of our present knowledge men with OL scores of 45 and above should be scored on P_1 scales and men with lower OL scores should be scored on P_2 scales. This will necessitate the construction of P_2 scales for all occupations, or at least for all occupations except those with high OL mean scores.

Summary.—If a person has a high OL score he is unlikely to obtain high scores on occupations with low OL mean scores; if he has a low OL score he is very likely to obtain such scores. On

[9] For 20 C.C.C. boys the percentages are 95 and 45; for 32 high school-junior college students they are 97 and 15; and for 97 of the Darley cases they are 93 and 25. All 149 cases have OL scores between 30 and 44.

the other hand, P_2 scales are so constructed that the OL factor plays a less important role in determining occupational scores. Once the fact has been determined that a man has a low OL score and therefore should possess interests related to occupations at that level, it seems theoretically better to determine what the occupations are in which he is interested with the use of P_2 scales.

Occupational-interest scores are used primarily for diagnostic purposes. When a number of such scales are all heavily weighted with one "factor" they all necessarily express the degree to which a man possesses this "factor"; but because of this condition such scales are unable to express satisfactorily the degree to which a man possesses other "factors." If, however, the dominant factor can be measured separately and then more or less subtracted out from the original scales, the resulting scales should more closely differentiate men in terms of the remaining "factors." This is what has been attempted by the development of P_2 scales; the OL factor is minimized, with the expectation that occupations, particularly those in Occupational Group IV, may be better differentiated thereby.

Part Seven

CONCERNING THE CONSTRUCTION AND SCORING OF AN INTEREST INVENTORY

Methods of scoring an interest inventory, the optimum number of items and size of criterion groups, and the stability of items are considered in chapters 23 to 25. Several minor studies relative to the nature of interests are included in chapter 26. The final chapter serves as an appendix of reference material which can be found more conveniently there than if scattered throughout the book.

Chapter 23. Methods of Scoring an Interest Test

Procedures for scoring an interest test, as used by a number of investigators, are reviewed in this chapter. Three special problems are considered in the next chapter, namely, the optimum size of weights, the optimum number of items, and the optimum size of a criterion group.

The two chapters disclose a growing realization that tests consisting of many items with norms based on several hundred cases are essential.

UNWEIGHTED SCORING PROCEDURES

Kelley (1914) and Moore (1923), the pioneers in this field, based their scoring upon the estimates of qualified experts. All others mentioned below have based their scoring upon objective criteria.

Scores have been calculated in terms of the standard error of the difference by Ream, Freyd, and several others, and in terms of the coefficient of correlation by Cowdery, Strong, Manson, and others.

Scores have usually been restricted to the range of +1, 0, and —1 by those employing the standard error of the difference, whereas they have not been so restricted by those using an expression of correlational regression. The various procedures will be summarized in chronological order and under the names of their respective authors.

Kelley.[1]—As far as the writer has been able to discover, the interest questionnaire of Kelley was the first one to be scored for group interests. "But there is little indication," according to

[1] T. L. Kelley, "Educational Guidance, An Experimental Study in the Analysis and Prediction of Ability of High School Pupils," *Teachers College, Columbia University, Contributions to Education,* No. 71, 1914.

Fryer, "that this pioneer study influenced the work of the later investigators into group interests. There is but one reference to the study during the years between 1920 and 1930 when the standardization of interest inventories had taken place, and this was in 1930."[2]

Kelley's questionnaire called for both estimates of interests and factual information. It was designed to measure a pupil's interests in mathematics, English, and history, but it was presumed to be broad enough to be adaptable to other types of interests as well. It called for expression of interests regarding magazines, books, sports, amusements, and vocations and evidence of ability with vocabulary.

The scoring keys were based on the estimates of experts. The several groups of items were graded for their significance in the three fields of mathematics, English, and history. Each of seventy magazines, for example, was thus assigned a weight. The weights of the five magazines selected by a student as most interesting were multiplied by 10, 8, 6, 4, and 2 for first, second, third, fourth, and fifth choices, respectively.

As Fryer has stated

> The purpose behind the measurement was prognosis of achievement. Regression equation technique was first applied here in interest measurement. Combination weights are given for the assembling of the scores for the various questions of the battery into a total interest score, as follows:
>
> Score in English Interests = .2 (Sports) +.05 (Amusements) +.4 (Vocations) —.25 (Factor of Accuracy) +.4 (Vocabulary) +1.0 (Magazines) +.05 (Books), etc.

Moore.[3]—Moore was interested in differentiating sales and design engineers. He used twenty occupational items, ten of mechanical and ten of social interests, so judged by fourteen judges. The subjects were asked to check ten of the twenty occu-

[2] D. Fryer, *The Measurement of Interests* (Henry Holt & Co., 1931), p. 42.

[3] B. V. Moore, "Some Principles and Practices of Personnel Selection, with Special Reference to Graduate Engineers," *Psychological Monographs* (1921), Vol. 30, Whole No. 138; and "A Tested Method of Using Tests for Vocational Guidance," *School and Society* (1923), 18, 761–64.

pations at which they preferred to work. The score was the number of checked items which had been judged to be social plus the number of unchecked items which had been judged to be mechanical, divided by the number of items. High scores indicated social interests; low scores, mechanical interests.

When 28 design engineers and 50 sales engineers were so tested, Moore found 82 per cent of the former and 78 per cent of the latter were correctly placed. The test was given to several groups of engineers in training. A subsequent follow-up of one group two years later showed 85 per cent were correctly placed on the basis of the work the engineers were then engaged upon.

Ream.[4]—Ream was interested in differentiating successful and unsuccessful life insurance salesmen. This he was unable to accomplish, possibly because (1) the two groups were not good enough representatives of what they purported to be, since they were only students of the subject with little actual experience, and (2) the groups were too small (27 successful and 12 unsuccessful agents). He did, however, develop a method of scoring an interest test based upon objective criteria, which has been extensively used by others.

His procedure was to calculate the percentage of his 27 successful and 12 unsuccessful salesmen who liked, disliked, and were indifferent to each item and to determine the standard error of the difference between the percentages of the two groups. Whenever the difference equaled or exceeded the critical ratio, the item was given a weight of one; all other items were disregarded. The weight was called +1 if more successful salesmen responded to the item than unsuccessful salesmen; otherwise the weight was called —1. An individual's score was the algebraic sum of the plus and minus weights.

The formulae employed in calculating the weights were:

$$\sigma(p_1 - p_2) = \sqrt{\frac{p_1 q_1}{N_1} + \frac{p_2 q_2}{N_2}}$$

$$\text{Critical ratio} = \frac{p_1 - p_2}{\sigma(p_1 - p_2)}$$

[4] M. J. Ream, *Ability to Sell* (Williams and Wilkins, Baltimore, 1924).

Freyd.[5]—Freyd followed Ream's scoring procedure except that a weight of 1 was assigned an item only when the critical ratio exceeded two (instead of one), a weight of 0 being assigned all other items. When the populations are small—in Freyd's case they were 29 salesmen and 30 engineers—most of the critical ratios are less than two, which results in relatively few items being used in the scoring of the test. Thus in Freyd's case there were only 28 items from among 198 which gave significant differences and entered into the scoring.

The reliability of Freyd's procedure as reported by Hubbard[6] is .52, based upon 285 freshmen men, and .47 for 313 freshmen women using the test-retest procedure with six weeks' interval. Over a year period the coefficients are .64 for men and .49 for women based upon two smaller groups.

Freyd's procedure was employed by Hubbard,[7] Craig,[8] Kornhauser,[9] and Remmers.[10] Only Hubbard and Remmers used samples of sufficient size to furnish enough critical ratios of varying sizes to suggest the possibility of employing a wider range of weights than that of +1 to —1.

Two objections may be made to Freyd's system of scoring. In the words of Cowdery

> No more advantage is given to those items having large significance, e.g., differences four or more times their standard errors, than to those that just meet the criterion of usefulness. The maximum of usefulness is not gained by the scoring method. In the second place this scheme does not put to use smaller differences, which, if weighted according to their degree of significance might add (1) to the reliability by dint of mere numbers, and (2) to

[5] Max Freyd, "A Method for the Study of Vocational Interests," *Journal of Applied Psychology* (1922), **6**, 243–52; and "Measurement of Interests in Vocational Selection," *Journal of Personnel Research* (1923), **1**, 319–28.

[6] R. M. Hubbard, "The Reliability of Freyd's Interest Analysis Blank," *Journal of Educational Psychology* (1926), **17**, 617–24.

[7] R. M. Hubbard, "Interests Studied Quantitatively," *Journal of Personnel Research* (1925–26), **4**, 365–78.

[8] D. R. Craig, "The Preference-Interest Questionnaire in Selecting Retail Saleswomen," *Journal of Personnel Research* (1924–25), **3**, 366–74.

[9] A. W. Kornhauser, "Results from a Quantitative Questionnaire on Likes and Dislikes Used with a Group of College Freshmen," *Journal of Applied Psychology* (1927), **11**, 85–94.

[10] H. H. Remmers, "The Measurement of Interest Differences between Students of Engineering and of Agriculture," *Journal of Applied Psychology* (1929), **13**, 105–19.

the validity of the final score, by taking account of all the available differences.[11]

(Actually Cowdery used 80 per cent of his 263 items in scoring for medical interest, in contrast to 14 per cent of 198 items used by Freyd.)

Miner.[12]—Miner tried out a different procedure to see if he would be able to differentiate four groups of students, who had indicated their vocational choices to be teaching, engineering, law, and medicine, and a fifth group of 570 cases taken alphabetically without regard to vocational choice. He points out that "the use of data from such pseudo-occupational groups is justified only for the purpose of trying out a method to see whether it promises to be sufficiently useful to justify an attempt to secure data with groups of people who have been long established in their vocations."

When students' blanks not used in developing the weights were scored on 28 items having satisfactory reliability (from among 37 all told), it was found that 54 per cent (2.2 times chance) had their highest totals in line with their choices. Since Miner's procedure has never been used further, we omit the details. He did accomplish two things. First, he demonstrated the possibility of differentiating occupational groups on the basis of interest. And, second, he did this by contrasting the interests of each occupational group with a random group. He also had the acumen to realize that such differentiation could not satisfactorily be based upon data from students; and, as he was not in a position to obtain the data from "people actually engaged in these and other professions," he did not carry the matter further.

WEIGHTED SCORING PROCEDURES

Cowdery and Kelley.—Cowdery[13] was interested in differentiating between physicians, engineers, and lawyers. In scoring his

[11] K. M. Cowdery, "An Evaluation of the Expressed Attitudes of Members of Three Professions [Medical, Engineering, and Legal"] (unpublished Doctoral dissertation, Stanford University Library, 1925), p. 43; and "Measurement of Professional Attitudes," *Journal of Personnel Research* (1926–27), **5**, 131–41.

[12] J. B. Miner, "A Method for Evaluating a Psychograph for Vocational Guidance," *Journal of Educational Psychology* (1926), **17**, 331–40.

[13] K. M. Cowdery, dissertation cited.

interest blank (a revision of Freyd's) he made use of the following formula, presented in class by T. L. Kelley.

$$\text{Weight} = 10\,\frac{\phi}{(1-\phi^2)\,\sigma} \quad \text{where } \phi = \frac{ad - bc}{\sqrt{(a+c)\ (b+d)\ (a+b)\ (c+d)}}$$

$$\text{and } \sigma = \sqrt{\frac{(a+c)}{N}\ \frac{(b+d)}{N}}$$

The data concerning any item from an interest test calling for liking, indifference, and disliking are in the form of a sixfold table; thus:

	L	I	D	Total
Medical	4	10	20	34
Nonmedical	16	27	28	71
Total	20	37	48	105

To reduce this sixfold table Cowdery made the assumptions "that the exact relations between the divisions of the attitude scale represented by the symbols L, I, and D are not known, and that the attitudes represented by I do not have the same relation to L and D throughout the test."[14] Accordingly, Cowdery sometimes grouped the I's with the L's, sometimes with the D's and sometimes divided the I's equally between the L's and the D's. In this particular case he grouped the I's with the L's on the basis that for this item "the interest reaction represented by the letter I is more like that represented by L than that by D." This conclusion is more apparent when the data referred to are expressed in percentages.

When the L's and I's are combined, the sixfold table for this item is reduced to a fourfold table, as follows:

	L and I	D	Total
Medical	*a* 14	20 *b*	34
Nonmedical	*c* 43	28 *d*	71
Total	57	48	105

[14] K. M. Cowdery, *op. cit.*, p. 44.

The calculation of the weight for liking (also indifference) for the item as expressed in this fourfold table, using the formulae given above, is as follows:

$$\phi = \frac{(14 \times 28) - (20 \times 43)}{\sqrt{(14+43)\ (20+28)\ (14+20)\ (43+28)}} = .1821$$

$$\sigma = \frac{\sqrt{57 \times 48}}{105} = .4981$$

$$w = 10. \frac{.1821}{.96684 \times .4981} = 3.78$$

This procedure and that of Ream and Freyd are to be distinguished from Moore's method in that "no *a priori* opinions have entered into the determination of the 'medicalness' of an item. The increment added to the final score by each item is directly dependent upon the significance of the item empirically determined from the responses received."[15]

Strong.[16]—Strong was interested in differentiating between a "men-in-general" group and occupational groups. In other words, did each occupational group have a characteristic pattern of interests and could all such groups be differentiated on that basis from a common point of reference? Strong introduced two changes in the procedure of Cowdery. First, all data were expressed in terms of percentages, thus automatically expressing the population of each group as 100,[17] giving a semi-equalized table. This made it possible to reduce the formulae used by Cowdery to:

$$\text{Weight} = 10 \frac{\phi}{(1-\phi^2)\sigma} \text{ where } \phi = \frac{a-c}{\sqrt{(a+c)\ (b+d)}}$$

$$\text{and } \sigma = \tfrac{1}{2} \sqrt{(a+c)\ (b+d)}$$

[15] K. M. Cowdery, *op. cit.*, p. 47.

[16] E. K. Strong, Jr., "Procedure for Scoring an Interest Test," *Psychological Clinic* (1930), **19**, 63-72.

[17] Under these circumstances $(a+c)$ and $(c+d)$ both equal 1.00 in the fourfold table and $\sigma = \frac{1}{2}\sqrt{(a+c)\ (b+d)}$, since N equals 2.00.

And furthermore this made it possible to construct a table from which all weights could be read directly as soon as the two percentages represented by *a* and *c* were determined.[18]

It may well be argued that reducing all data to percentages and thus permitting many short cuts is to be questioned in that the factor of size of population is thereby disregarded. It happened, however, that at that time a sample of 100 cases was deemed ample, so that the percentage procedure approximated the actual situation as far as population was involved. Later on it was found that 100 cases were not enough; since then, the majority of scales have been based on 250 cases. This means that the weights actually used are smaller than would be obtained if based on 250 cases. This again has produced no difficulty because the range of weights has been reduced from ±15 to ±4.[19]

The second change in procedure was concerned with the reduction of the sixfold table to a fourfold table. In some cases Cowdery's procedure did not seem to give appropriate scores, and consequently, in calculating weights for liking, indifference and disliking were combined together, and in calculating weights for indifference the liking and disliking were combined, etc. In other words the dichotomy was between those who chose the L response and those who did not, etc.

The calculation of the weight for liking the item "actor (not movie)" for the original engineer-interest scale follows. The data are:

	Men in General		Engineers	
	N	Percentage	N	Percentage
Like	976	25	23	9
Indifference	1,327	34	78	30
Dislike	1,601	41	158	61
Total	3,904	100	259	100

[18] The table is reproduced on p. 255 of *Occupational Counseling Techniques*, by W. H. Stead and C. L. Shartle (American Book Co., 1940), who give only this method of scoring an interest test.

[19] See p. 623 for further consideration of this point.

The fourfold table is

a	.25	.75	b
c	.09	.91	d

$$\phi = \frac{.25 - .09}{\sqrt{(.25 + .09)\ (.75 + .91)}} = .213$$

$$\sigma = \tfrac{1}{2}\sqrt{(.25 + .09)\ (.75 + .91)} = .3756$$

$$\text{Weight} = 10.\ \frac{.213}{(1 - .213^2)\ .3756} = 6$$

The weight is multiplied by 10 and the nearest whole number is taken in order to eliminate the use of decimals. A plus or a minus sign is assigned to the weight, depending upon whether the percentage of the occupational group in question is greater or smaller than the corresponding percentage for men in general. In the case before us a minus sign is added, giving —6, since engineers like "actor" less than men-in-general.

The weights are a mathematical expression of two factors: first, the extent to which the data in the fourfold table differentiate engineers and "men in general" (represented by the numerator of the equation); and, secondly, the extent to which the data might be the resultant of chance (represented by the denominator of the equation). The more, then, the data differentiate the two groups and the less likely the data are to be due to mere chance, the larger the weighting and vice versa.

This procedure was also employed by Manson in the development of ten rating scales for women.[20] A quite different procedure but based upon correlational relationships was used by Hubbard in which the criterion for mechanical interest was score in mechanical ability.[21]

Kelley's revised formulae.—In 1934 Kelley[22] recommended two new formulae in place of his earlier formula used by Cowdery and Strong. One of these two new formulae is to be used with

[20] G. E. Manson, "Occupational Interests and Personality Requirements of Women in Business and the Professions," *Michigan Business Studies* (1931), Vol. **3**, No. 3.

[21] R. M. Hubbard, "A Measurement of Mechanical Interests," *Pedagogical Seminary and Journal of Genetic Psychology* (1928), **35**, 229–54. See p. 505, above.

[22] T. L. Kelley, "The Scoring of Alternative Responses with Reference to Some Criterion," *Journal of Educational Psychology* (1934), **25**, 504–10.

semi-equalized tables, illustrated below; the other with non-equalized tables, likewise discussed below.

In the earlier formulae ϕ/σ was modified by $1/1 - \phi^2$, which is proportional to the square of the standard error of ϕ. Kelley points out that ϕ/σ should have been modified by a quantity proportional to the square of the standard error of ϕ/σ, instead of merely ϕ. "It is appropriate to weight a factor inversely as the square of its standard error when it is combined with others of different reliability to obtain the most reliable average or sum." Accordingly, the revised formulae for semi-equalized fourfold tables is

$$W = 4N \left\{ \frac{\Delta}{1 - 4j\,\Delta^2} \right\}$$

Where $4N$ is a constant and may be omitted

$\Delta = \frac{a}{n} - pP$, that is, the relative frequency in any cell minus the relative frequency expected by chance.

$$j = \frac{1 - 3pq}{p^2 q^2}$$

In calculations with a semi-equalized table, $\Delta = \frac{a - c}{2}$.

The calculation of the weight for the following semi-equalized table, with the constant $4N$ omitted, is as follows:

	Items Marked	Items Not Marked	Total
Engineers	.35	.15	.50
Others	.26	.24	.50
Total	.61	.39	1.00

$$W = \frac{\frac{1}{2}(.35 - .26)}{1 - 4\left\{\frac{1 - 3\,(.35 + .26)\,(.15 + .24)}{(.35 + .26)^2\,(.15 + .24)^2}\right\}\left(\frac{(.35 - .26)}{2}\right)^2} = .0469$$

Weights so obtained are multiplied by 100 and only whole numbers used. The decimal .0469 is accordingly called 5 and plus 5, since more engineers than non-engincers like the item. Here again a chart has been developed from which the weights can be read by merely looking up the two percentages a and c. Subse-

quently a second chart was developed limiting the range of weights to ±4. On this chart the weight of 5 is 2.

a) Kelley's original and revised formulae contrasted.—Kelley published twelve comparisons of weights obtained from his old and his revised formulae. He concludes:

> The discrepancies of the weights as given by the old formula may be summarized in the statement that small Δ's (synonymous with "very likely to occur as a matter of chance") are overweighted and large Δ's underweighted. The old formula does seem to yield results sufficiently different from those given by the new formula to warrant abandoning it entirely and using the formula given on page 912 in the case of non-equalized tables, and using the formula [not repeated here] in the case of semi-equalized tables.[23]

In order to discover what effect there would be in changing from the old to the new formula in the scoring of interest blanks, Strong and Carter[24] prepared three sets of scales for five occupational interests. The first set made use of the old formula, employing weights ranging from +15 to —15. The second and third sets of scales made use of the revised formula, with weights ranging in the second set between +15 and —15 and in the third set between +4 and —4. In all three cases the data were reduced to percentages, i.e., semi-equalized. It was found that the three sets of scales correlated between .985 and .988 with each other; but that the second set differentiated occupational groups slightly better than sets one or three.[25] Since Kelley believed his revised formula was superior to the original formula and our data substantiated this conclusion, the revised formula was adopted by us. As there is only slightly less differentiation when the range of weights is restricted to ±4 in comparison to ±15 and there is a considerable saving in labor of scoring when the weights are small, the weights on the revised formula were restricted to the smaller

[23] T. L. Kelley, *op. cit.*, pp. 509–10. The quoted material has been altered by us to adapt it to our text.

[24] E. K. Strong, Jr., and H. D. Carter, "Efficiency Plus Economy in Scoring an Interest Test," *Journal of Educational Psychology* (1935), **26**, 579–86.

[25] The second procedure was superior to the first in 17 comparisons among 30. Rock and Wesman found in one comparison the first procedure was better than the second by a very small difference. R. T. Rock, Jr., and A. Wesman, "The Comparative Efficiency of Various Methods of Weighting Interest Test Items," *Psychological Bulletin* (1939), **36**, 569–70.

range, i.e., to ±4. (Weights obtained from the revised formula are converted into the ±4 weight range on the following basis: weights of 0 and 1 according to the formula are called 0 on the ±4 basis, weights of 2 to 4 are called 1, weights of 5 to 7 are called 2, weights of 8 to 10 are called 3, and all weights of 11 and over are called 4. Negative weights are similarly transmuted.)

The change from the old formula with weights from 15 to —15 to the new formula with weights from 4 to —4 gives results which differ inconsequentially (average of 30 critical ratios is 10.72 and 10.68, respectively).

b) *Nonequalized versus semi-equalized tables.*—Kelley calls attention to a distinction which should determine whether one or the other of his two revised formulae should be used. If the emphasis is upon differentiating engineers as a group from non-engineers as a group, it is appropriate to rule out the sizes of the two groups. In this case the groups should be equalized for size, yielding a semi-equalized table, such as illustrated above. "However, if the purpose is to take an individual drawn from the general population and then note how far he diverges from it in the direction of the interests of engineers, it would seem that the original or nonequalized table should constitute the basic data."

When the constants advocated by Kelley are used with his two formulae, the weights so derived approximate each other except in those cases where one or both percentages in the fourfold table closely approach 0 or 100. And when both sets of weights are reduced to a ±4 range, the differences between them are immaterial (see Table 154).

Inasmuch as the weights obtained by both of Kelley's revised formulae are so nearly identical, it seems superfluous to discuss the relative merits of the two formulae on theoretical grounds. It is possible that Kelley is correct in advocating use of the nonequalized formula when the objective is to note how an individual drawn from the general population diverges from it in the direction of the interests of a particular occupation. But this would seemingly hold only when there is a definite relationship between the size of the occupational criterion group and the size of the men-in-general group. It would be a stupendous feat to constitute every criterion group proportionately to their number according

to the census, with the smallest group equaling not less than 250 cases. Without such a relationship holding between all criterion groups it becomes almost farcical to base weights on mere size of populations. Whether the men-in-general group is 1,000, 4,000, or 10,000 is largely a matter of choice; but the total number used would affect the size of weights appreciably if the nonequalized formula were used. Similarly 500 engineers would not be weighted the same as 250 psychologists; yet who is there to claim that 500 blanks of engineers represent all the thousands of engineers better than the 250 psychologists represent the 540 male full members of the American Psychological Association?

The only logically sound procedure at the present time is to assume that each sample represents its occupational group and to go ahead on that basis. That means that the data from each sample will be reduced to percentages and that whether we happen to have 500 engineers and 250 psychologists or some other number, both occupational groups will be considered to have 100 cases and these 100 cases will be contrasted with 100 cases representing men in general.

Guilford.[26]—The element $(1 - \phi^2)$ in the denominator of the Cowdery-Kelley formula is questioned by Guilford, on the ground that the reliability of the regression weight "should have nothing to do with the size of the contribution of an item to the total score." His criticism applies also to Kelley's revised formula, which contains an index of reliability of the regression weight itself instead of merely an index of reliability of ϕ. Omitting $(1 - \phi^2)$ there results the formula:

$$W = \frac{p_u - p_l}{4\,p_2q_2} \text{ or } \frac{a - c}{4(a + c)\ (b + d)}$$

This formula gives weights ranging from —1.0 to +1.0. To increase the range to 8 and to eliminate negative weights, Guilford uses the formula, $W = \frac{p_u - p_l}{p_2q_2} + 4$. Such weights may be obtained from his Figure 1 by merely noting the weight opposite a and c.

[26] J. P. Guilford, "A Simple Scoring Weight for Test Items and Its Reliability," *Psychometrika* (1941), 6, 367–74; also, "The Phi Coefficient and Chi Square as Indices of Item Validity," *Psychometrika* (1941), 6, 11–19.

Table 154 shows the relationships between the weights on several different scoring systems. In all these systems the weights increase as $a - c$ increases, but not at the same rate. Offhand there would appear to be no reason why one system should be particularly superior to any other. In fact weights based on one-tenth

TABLE 154

WEIGHTS WITH TWO KELLEY FORMULAE, GUILFORD'S FORMULA, AND IN TERMS OF CRITICAL RATIOS, WHEN 60 PER CENT OF GROUP A LIKE AN ITEM AND THE PERCENTAGE OF GROUP B VARIES FROM 60 TO 5

Percentage Likes of Group B	A-O	Kelley-Cowdery		Kelley Revised		Guilford	Critical Ratios		
		Weights	Weights Restricted to ±4	Weights	Weights Restricted to ±4	Weights Restricted to ±4	N = 100 and 100	N = 4000 and 250	N = 4000 and 521
60.....	0	0	0	0	0	0	0	0	0
55.....	5	1.0	0	1	0	0	.7	1.5	2.2
50.....	10	2.1	1	3	1	0	1.4	3.1	4.3
45.....	15	3.1	1	4	1	1	2.2	4.6	6.5
40.....	20	4.2	1	5	2	1	2.9	6.3	8.8
35.....	25	5.3	2	7	2	1	3.7	8.0	11.2
30.....	30	6.7	2	8	3	1	4.5	10.0	14.0
25.....	35	8.2	3	10	3	1	5.4	12.3	17.1
20.....	40	10.0	3	12	4	2	6.3	15.2	20.8
15.....	45	12.2	4	16	4	2	7.4	18.8	25.9
10.....	50	15.1	4	20	4	2	8.7	24.4	32.9
5.....	55	19.1	4	30	4	3	10.3	34.8	44.7

of $a - c$ are approximately equal to those employed by us using either Kelley's original or his revised formula with a ± 4 range. If Guilford's constants were changed slightly his weights would also approximate $\frac{a - c}{10}$. It is not surprising that Rock and Wesman[27] report practically no difference in amount of differentiation resulting from use of the critical ratio and the correlational procedures used by Cowdery, Kelley, and Strong. Critical ratios squared reduced overlapping from about 13.5 per cent to 10.7 per cent. Several iteration methods differentiated still better, but these are open to the serious objection of assigning very large weights to items (see discussion on p. 623).

If an item is to be given a weight, other than zero, only when

[27] R. T. Rock, Jr., and A. Wesman, *op. cit.*

the critical ratio of the difference between the percentages of the two groups is 3 or more, then in the situation considered in the table $a - c$ must approximate 21 when N of the two samples is 100 each. But when the men-in-general group numbers 4,000 and the occupational group 250—the typical populations with our scales—$a - c$ need be only 10. Actually in our present weighting procedure a weight of one is given an item when $a - c$ equals 6, which corresponds to a critical ratio of 1.85.

Regardless of what scoring procedure is used, the experimenter must use his own judgment as to what size of $a - c$ difference is to be ignored, what size is to be given the weight of one, and what range of weights is to be employed. Should a minimum weight be assigned when the critical ratio is 1, 2, 3, or 4? (Guilford's minimum weights in Table 154 correspond to a critical ratio of 4.) What effect have such varying standards upon reliability and validity? What is the optimum standard?

Interest items weighted against other test scores.—Only two examples need be mentioned here of procedures used in evaluating interest items in terms of other test scores. Dunlap employed five competent judges to classify items as to the specific school subject to which they seemed most closely related. For example, "quotients" and "sums" were classified as arithmetic, "punctuation" and "semicolons" as grammar, etc.

> Each item was then evaluated for its predictive value by comparison with the scores on the corresponding sub-tests of the *New Stanford Achievement Test.* Weights were determined for each of the four response categories of each item [L, I, D, and U—unfamiliar] on the basis of the biserial correlation with the appropriate criterion.[28]

Rothney[29] devised six scales to measure interest in five school subjects and average scholastic interest. The interests of students majoring in one subject were not contrasted with the interests of students in general, but the responses to each item were weighted against discrepancy scores in each school subject. *D* (discrepancy) scores were used "to eliminate the influence of scholastic aptitude

[28] J. W. Dunlap, "Preferences as Indicators of Specific Academic Achievement," *Journal of Educational Psychology* (1935), **26**, 412; see p. 543.

[29] J. W. M. Rothney, "Interests of Public Secondary-School Boys," *Journal of Educational Psychology* (1937), **28**, 561–94. His results are considered on p. 790.

and chronological age on school achievement. . . . . Predictions were made of the student's achievement on the basis of scores on the Terman *Group Test of Mental Ability* and chronological age. Actual scores were then subtracted from predicted scores to obtain measures of achievement uncorrelated with age and intelligence test scores." In the second place he used biserial ϕ. The scoring weight was biserial ϕ divided by the unreliability of the whole regression coefficient, as in Kelley's revised formula. His work formula is

$$b' = \frac{10\,(Ma - Mb)}{\frac{1}{PaPb} - \frac{(Ma - Mb)^2}{\sigma_2^{\,2}}}$$

Ma = the mean discrepancy score of those students who choose the L response, Mb = the score of those who do not choose that response.

$\sqrt{PaPb} = \sigma_1 = \sqrt{\frac{na}{N} \cdot \frac{nb}{N}}$; where na = the number of students who choose the L response and $na + nb = N$. σ_2 = standard deviation of discrepancy scores of the school subject.

SCORING BASED ON SIMILARITIES

The data in chapter 6 concerning similarity of interests raise two theories: Could not interests be scored just as well in terms of similarities as in terms of differences? And would not there be rather different conclusions resulting from the two procedures? For example, scoring the blanks of men and women on two scales expressive of the interests of each sex might yield results not now disclosed by using the MF scale, which stresses the differences between the sexes.

Scoring in terms of similarities gives a procedure in general conformity to most psychological tests where amount of a quality is measured. Scoring interests differs, however, from scoring memory and intelligence tests in that there are no inherently right or wrong responses to interest items as there are with memory and

intelligence tests. Consequently, whether occupational interests are to be scored in terms of differences or similarities it is necessary at the very beginning to set up some standard as to what are acceptably right and wrong interests. Since the differences in responses of lawyers and men in general are accepted as the basis for deciding what are right and wrong responses for lawyer interest, it is logical to accept the responses of lawyers alone as the basis for right and wrong responses for lawyer interest when similarities are to be considered. Thus, if the responses of one hundred lawyers to a given item are Like 60, Indifferent 25, and Dislike 15, we can score responses to this item by giving 60 for a like response, 25 for an indifferent response, and 15 for a dislike response. Such scores indicate the degree to which an individual agrees with lawyers.

For the lack of a better name we have called such a scoring system the "percentage" system, as the weights are based on the percentages of the criterion-group responses to each item.

Percentage system of scoring.—Four scoring systems to measure an occupational interest may be recognized:

1. Scoring based upon differences in responses of a criterion group and a men-in-general group.

a) Weights equal the differences expressed in percentages.

b) Weights derived from Kelley's formula (regular system, discussed above).

2. Scoring based upon responses of criterion group alone.

a) Weights equal the percentage of response to each item by the criterion group (percentage system).

b) Percentage weights reduced on some basis to weights ranging from 1 to 9, thus making them comparable in size to the ±4 range in 1*b* (percentage-weight system).

Table 155 gives the averages for five lawyers of such "percentage" scores (2*a* procedure) for all the items on the blank in terms of the interests of nine occupations. These scores seemingly differ very little, ranging from 36.78 to 46.42; nevertheless the average critical ratio is such that approximately differences of 3.50 are statistically significant. Table 156 gives the standard scores for these same five lawyers when scored on the regular scales. The rank-order correlations between the two sets of scores

for the five lawyers range between .87 and .92. Similar data on five chemists give a range of coefficients between .82 and .985. Corresponding data on twenty college seniors who subsequently became lawyers give correlations ranging between .10 and .91 (average of .58). The low correlation was with the lawyer scale, where scores are greatly restricted in range in both cases. These few cases are sufficient to show the trend of such a scoring system since our chief concern is with the weighted-percentage scoring.

TABLE 155

AVERAGE "PERCENTAGE" SCORES OBTAINED BY FIVE LAWYERS FOR INTEREST IN NINE OCCUPATIONS

Occupational Scale	Code Numbers				
	No. 3	No. 11	No. 21	No. 26	No. 36
Artist	41.47[a]	42.77	41.07	39.91	40.01
Chemist	39.34	44.27	41.29	38.82	39.99
Carpenter	36.78	41.43	38.68	38.47	39.43
Minister	40.67	43.33	40.46	40.23	42.69
Musician	40.53	43.81	40.38	40.30	42.15
Certified public accountant	40.97	44.11	42.39	42.31	42.06
Banker	40.06	41.81	40.35	42.10	41.72
Life insurance salesman	41.47	43.33	42.85	46.42	44.82
Lawyer	43.30	45.06	43.46	44.04	43.59

[a] The sigmas for these means range from 17.3 for musician to 20.8 for minister with average of 19.3.

TABLE 156

STANDARD SCORES ON REGULAR SCALES OBTAINED BY FIVE LAWYERS FOR INTEREST IN NINE OCCUPATIONS

Occupational Scale	Code Numbers				
	No. 3	No. 11	No. 21	No. 26	No. 36
Artist	33	30	25	21	22
Chemist	15	39	23	−3	9
Carpenter	−5	11	2	−2	7
Minister	23	24	16	11	28
Musician	33	41	22	17	38
Certified public accountant	32	39	36	29	32
Banker	31	22	23	35	34
Life insurance salesman	42	35	42	67	55
Lawyer	55	49	48	50	47

Percentage-weight system of scoring. (This is the 2*b* procedure mentioned above.) To obviate the use of large numbers in scoring, the percentages have been reduced to weights ranging from 1 to 9 in which percentages of 0 to 9 were given the weight of 1; percentages of 10 to 19, the weight of 2, etc.; except that all percentages of 80 and above were given a weight of 9.[80] In order to explore the possibilities of using such a scoring system, thirteen occupational scales were prepared, which will be referred to as "percentage-weight" scales.

The reliabilities of the percentage-weight occupational scales average .84, whereas the average reliability of the corresponding regular scales based upon Kelley's formula is .87.

TABLE 157

COMPARISON OF SCORES ON ACCOUNTANT "PERCENTAGE-WEIGHT" SCALE AND REGULAR SCALE

Occupations[a]	Percentage-Weight Scales		Standard Score		Critical Ratio		Percentage Overlapping[b]	
	Raw Score	σ	Percentage-Weight Scales	Regular Scales	Between Means of Accountant and Percentage-Weight Scales	Between Means of Accountant and Regular Scales	Between Accountant and Percentage-Weight Scales	Between Accountant and Regular Scales
Accountant	2009	75.1	50.0	50.0	....	....	..	..
C.P.A.	1980	75.7	46 2	42.6	2.7	4.7	85	74
Production manager	1968	69.5	44.5	35.1	4.0	10.2	78	47
Lawyer	1915	77.3	37.4	25.9	8.7	16.3	54	26
Life insurance salesman	1911	82.1	37.0	25.1	8.8	15.7	53	27
Printer	1898	71.7	35.2	31.6	10.7	12.6	45	37
Physician	1897	75.8	35.0	18.8	10.5	22.9	46	11
Musician	1884	79.8	33.4	26.4	11.4	15.2	42	27

[a] N = 100 or more

[b] See footnote on page 110.

The overlapping between the scores of two occupations on percentage-weight scales is 60 per cent greater than with regular scales (see Table 157). This fact is further demonstrated in Table

[80] The distribution of 7,200 percentages on 6 scales is somewhat skewed, with an average at 33.5 and a σ of 40.0. Using such figures as a basis for the short-cut scoring system would give a weight of 1 for 0 to 8.4, 2 for 8.5 to 18.4, etc., up to 8 for 68.5 to 78.4 and 9 for 78.5 and above. This is theoretically a better procedure; but the one actually used is far easier to work with.

158, where ratings in accountant interest of five occupations are given for both percentage-weight scales and regular scales. Only 17.5 per cent of the four nonaccountant groups rate A on regular scales, in contrast to 33.2 per cent on percentage-weight scales and 46.3 per cent rate C+ and C on regular scales in contrast to only 19 per cent on percentage-weight scales.

TABLE 158

PERCENTAGE OF A, B+, B, B−, C+, AND C RATINGS FOR FIVE CRITERION GROUPS

(N = 100 of each criterion group)

Criterion Group	Percentage-Weight Accountant Scale						Regular Accountant Scale					
	A	B+	B	B−	C+	C	A	B+	B	B−	C+	C
Accountant	72	12	7	6	..	3	74	11	6	4	3	2
Doctor	12	24	17	20	13	14	1	3	5	3	9	79
Production manager	52	24	9	4	9	2	16	14	21	13	23	13
Printer	14	18	20	15	20	13	9	11	18	14	17	31
C.P.A.	55	17	14	9	2	3	44	22	11	10	7	6

Intercorrelations between the thirteen percentage-weight scales range between .13 and .91 and average .64. The corresponding intercorrelations based on the revised regular scales in Table 193 (facing p. 716), average zero. Differentiation is clearly much less with percentage-weight scales than with regular scales. (If the percentage-weight scale had been based on 345 accountants, as was the regular scale, instead of 100 cases there would have been less differentiation between accountants and the other four occupations (see p. 641). On such a basis there would be an even greater difference between the two scales than is shown in the table.)

Value of percentage-weight scales.—Percentage-weight scales measure the degree to which a person has the interests most typical of members of the occupation. There may be certain situations where such information would be valuable. The writer has not, however, explored such possibilities.

They are not as useful as regular scales in differentiating occupations, nor in assigning individuals to the occupation for which their interests fit them best. They are not as useful because they do not take into account the differences in interests between an occupation and men in general.

Chapter 24. Optimum Size of Weights, Number of Items, and Size of Criterion Group

Three problems relative to the construction and scoring of an interest inventory are considered in this chapter.

OPTIMUM SIZE OF WEIGHTS

What is the optimum range of weights to be used with an interest test? Ream and his followers contented themselves with weights of +1, 0, and —1, what we shall refer to as unit weighting. Cowdery and Strong have used weights ranging as widely as from +30 to —30. Are unit weights sufficient or is there added value in weighted scales?

It is obvious that the smaller the weights the easier the scoring, so that as far as this first consideration is concerned the aim should be small weights if not unit weights.

Reducing the weights reduces the variability of scores and thus should reduce the correlation. Consequently weighted scales should have higher reliability than unit scales. An example of this is given below, page 632, but in most comparisons the writer has made between different weighting systems the simpler method has given higher reliability. The differences in reliability have been small, amounting to only two- or three-hundredths.

Ease of scoring and reliability should not be considered as important as validity, for a test's value should be stated very largely in terms of its capacity to measure adequately that which it is designed to measure. Validity of the *Vocational Interest Blank* must be measured in two ways: first, with regard to differentiation of occupations and, second, with regard to prediction of occupation for young people. A procedure which gives

optimum results in one case may not do so in the other. For example, it may be appropriate to give an item a weight of 30 in differentiating one occupational group from another, but it might not be good procedure where the test is used for vocational guidance, especially in those cases where the test contains items unknown to the person taking the test. Years ago the item, liking to be a Certified Public Accountant, was weighted +30 on the C.P.A. scale. If a young man who actually ought to go into public accounting marked the item as indifferent because he had never heard of the occupation, he was penalized 39 points—loss of 30 for not checking liking and 9 points for checking indifference (with a weight of —9). This seemed to be too heavy a penalty for mere lack of information.

We are faced with a dilemma in the case of many items: shall they be weighted as the statistics indicate in order to secure maximum differentiation of occupational groups or shall weights be reduced in order, on the one hand, to make it more difficult for someone to fudge the results or, on the other hand, to not penalize an honest person who doesn't happen to know the meaning of the items? The trend has been to reduce the weights so as not to penalize too greatly young people who are not familiar with certain items.

Reduction of weights from a range of ±30 to a range of ±4.— It was largely on the basis of this consideration that the original occupational scales for the Strong *Vocational Interest Blank* issued in 1928 were revised in 1930 to the extent of changing all weights above +15 and below —15 to those amounts. This was actually a very slight revision, since there were only 55 such changes among 18,900 weights on 25 occupational scales.

Isabelle Rosenstein and Edward Birnberg of the University of Minnesota reported in a letter of June 3, 1929, that a range from 9 to 0 (which is equivalent to ±4) gave the same results as when the range from 30 to —30 was used. Their weight of 9 was given to all our weights above 10; their weight of 8 to our weights of 10, 9, and 8; their weight of 7 to our weights of 7, 6, and 5; etc. In fifteen comparisons between the two weighting systems, the correlations ranged between .965 and .996, with an average of .984. Furthermore, when the ratings of A, B+,

B, B—, and C were considered it was found that in 350 out of 360 cases the same rating was secured by both methods and the remaining ten cases were all borderline cases, one falling on one side, the other on the other side of a critical score separating letter ratings.[1]

Weights of 1, 0, and —1.[2]—If weights with ±4 range give the same results as others with ±15 range, may not weights with ±1 range be equally useful? To test out this assumption, occupational scales were prepared where all weights of +2 or more were weighted +1; weights of +1, 0, and —1 were weighted 0; and all weights of —2 or less as —1. Correlations were calculated between scores obtained with these new scales, referred to as "unit" scales, and the regular scales. The average of ten such coefficients is .92 (ranging between .837 and .982). Although these coefficients are not so high as those between scales weighted ±15 and ±4, yet one might conclude that unit scales could be substituted for weighted scales.

When reliability of the two sets of scales is considered, we find that the unit scales give slightly higher reliability based on the odd-even technique.

The unit scales did not, however, differentiate occupational groups from one another as well as did the weighted scales. The data are set forth in Table 159, where it is shown that 10 per cent of architects rate A on the lawyer scale—that is, have the interests of lawyers when the weighted scale is used—whereas 30 per cent are so rated when the unit scale is employed. In this case there is three times as much overlapping in the range of A ratings when the unit scale is used as when the weighted scale is utilized. Judging from the average of the seven comparisons in Table 159, overlapping is increased more than three times by the unit scales in contrast with the weighted scales, when measured by A ratings. Furthermore, twice as many men will be definitely rated as not belonging to a group to which they do not belong when the weighted scales are used as when the unit scales are used.

[1] E. K. Strong, Jr., and H. J. Green, "Short Cuts to Scoring an Interest Test," *Journal of Applied Psychology* (1932), **16**, 1–8.

[2] E. K. Strong, Jr., "Procedure for Scoring an Interest Test," *Psychological Clinic* (1930), **19**, 63–72.

Research of Dunlap.[3]—These two studies, independently carried out at the same time, led us to believe that weights ranging between +4 and —4, or approximating that range, gave optimum results. The data in Table 159 (and in other similar tables not published and now lost) seemed to be conclusive that unit scales were not as useful as weighted scales in differentiating occupations. Very much to our surprise Dunlap reported in 1940 that unit scales gave approximately the same results as weighted scales.

TABLE 159

EXTENT TO WHICH MEMBERS OF OCCUPATIONAL GROUPS ARE RATED A, B, AND C IN INTEREST IN LAW, ARCHITECTURE, AND PUBLIC ACCOUNTING, DEPENDING UPON WHETHER THE WEIGHTED OR THE UNIT SCALES ARE USED

Occupational Group	Rated as to Interest	Weighted Scales			Unit Scales		
		A Exceed —1Q	B Bet. —1Q and —3.5Q	C Below —3.5Q	A Exceed —1Q	Bet. —1Q and —3.5Q	C Below —3 5Q
50 Architects..	Law	10	72	18	30	50	20
45 C P.A.'s.....	Law	31	65	4	42	56	2
45 C.P.A.'s.....	Architecture	2	20	78	9	51	40
83 Lawyers....	Architecture	2	25	73	10	52	38
50 Architects..	Accounting	2	38	60	24	48	28
83 Lawyers....	Accounting	7	65	28	32	64	4
58 Journalists.	Accounting	0	47	53	29	55	16
Average.....		7.7	47.4	44.9	25.2	53.7	21.1

Dunlap reduced all our weights of 2 to 4 to 1 and —2 to —4 to —1, while weights of 1, 0, and —1 were left unchanged. Three groups of blanks were scored on 14 pairs of weighted and unit scales. The correlations between the two sets of scores ranged between .956 and .987 for 254 salesmen of the International Business Machines Corporation, between .948 and .974 for 234

[3] J. W. Dunlap, "Simplification of the Strong Vocational Interest Blank," *Psychological Bulletin* (1940), **37**, 450; also B. M. Peterson and J. W. Dunlap, "A Simplified Method for Scoring the Strong Vocational Interest Blank," *Journal of Consulting Psychology* (1941), **5**, 269-74; and B. M. Peterson and J. W. Dunlap, "Derivation and Application of a Unit Scoring System for the *Strong Vocational Interest Blank for Women*," *Psychological Bulletin* (1941), **38**, 607.

University of Minnesota students, between .963 and .985 for 384 University of Rochester students, and between .957 and .988 for all three groups combined.

"Regression equations were then constructed for each experimental group [the three given above] for predicting original scores from a knowledge of the simplified [unit] scores . . . . For any given occupation the slope of the line is, for all practical purposes, identical for the three experimental groups . . . . In 18 out of 30 cases the differences between the various pairs of regression coefficients for a given occupation were not significant."

Three control groups comparable to the three experimental groups were scored on both sets of scales. Weighted scores were also calculated from unit scores in terms of the ascertained regression coefficients. The correlations between regular scores and such calculated scores "varied from .854 to .953 for the I.B.M. data, from .920 to .971 for the Minnesota data, and from .937 to .981 for the Rochester data. The correlations for the total control group varied from .913 to .972. It will be noted that these correlations closely approach the magnitude of the correlations for the experimental groups."

"The predicted scores differed from the actual scores by one rating [for example, from C to C+, C+ to B—, etc.], in 26.3 per cent of the cases, and by two ratings[4] in only 1.2 per cent of the cases."

How serious are the shifts in ratings which occur in about 30 per cent of cases? Peterson and Dunlap make a statement in this connection which we can only partly support. They say:

> These shifts, however, are for the most part not significant. It is of no importance if one method rates an individual C and the other C+, or one rates him A and the other B+. Counselors rarely attach much weight

[4] Dunlap uses "half-letter" and "whole letter rating." This terminology has proved to be confusing since some think of a "whole letter" as from C to B, whereas that is actually twice what is intended, involving shifts from C to C+ to B— to B. One rating represents a half standard deviation, i.e., from 35 to 40 or 40 to 45 standard score, and two ratings represent a full standard deviation, i.e., from 35 to 45 or 40 to 50 standard scores. Actually shifts from C to C+ or from A to B+ may involve more than a half standard deviation but these greater amounts are ignored here since all C ratings indicate lack of interest and all A ratings indicate presence of interest.

to scores less than B+; thus, the critical scores are those that shift between B and B+. Of particular importance are those cases where the individual has an original score of B+, but according to the simplified scoring, would be rated only B. If no favorable advice is given on a B rating, the individual's attention is not called to the field. If, however, the true score is B and the simplified score is B+, then slightly more emphasis is given to the occupation than is its due. This is not so serious as the failure of the counselor to mention the occupation.

Dunlap calculates that 3.5 per cent of all the cases are B+ scores, when the regular scoring system is used, which become B when the unit scoring system is employed. "Advice will be in error only once in 33 times."

We agree that it makes little or no difference in counseling whether a man's score is C or C+ or B—; but shifts from B— to B or B+ or A and vice versa will often produce a different over-all pattern. If guidance is based on the highest score or the two or three highest scores, we need to consider only the chance that these one to three highest scores will be in error; but if guidance is based on the total pattern of occupational interests, which as we have pointed out in chapter 17 should be the procedure, then we need to consider the chance that scores ranging from high B— to A ratings may be in error when the simplified scoring procedure is used. Dunlap does not furnish the necessary data for such calculations. From Tables 97 to 99, page 365, it appears that 35 per cent of occupational ratings fall in the range of high B— to A. According to Dunlap 26.3 per cent of unit scores differ from original scores by one rating (B— to B, etc.) and 1.2 per cent differ by two ratings (B— to B+, etc.). This means 9.6 per cent of ratings will differ from the original scores in the range of significant ratings when the simplified scoring system is used. It must be recognized, however, that some of the shifts among the 9.6 per cent would have little or no effect upon a proper interpretation of a person's interest profile. But even if a third were so eliminated the remaining error would be greater than Dunlap's "once in 33 times."

Intervening between our early research and that of Dunlap are certain statistical studies which supply theoretical justification for expecting high correlations between two different weighting

systems. Richardson[5] concludes that "as the number of positively correlated measures [items] is increased, the correlation between the two combinations approaches unity." But even if the correlation between two different weighting systems is .95, there is still room for differences in validity. Our data apparently established that though weighted scales correlate highly with unit scales they give greater validity. Dunlap's study differs from ours in that he finds less difference in validity between weighted and unit scales than we did. It is possible that the difference between these two researches is a resultant of the scales used. Our research employed the original scales based on relatively small populations. Dunlap's studies employed our revised scales with larger criterion groups.

A second study from Dunlap's laboratory reported by Kogan and Gehlmann[6] involved the blanks of 281 freshmen and a third study by Harper and Dunlap[7] concerned the women's blank. Here the blanks of 328 women were used for the experimental group and 223 additional blanks for the control group. Further verification was obtained by scoring the blanks of 152 college freshman women. Substantially the same results were obtained in these two studies as reported by Peterson and Dunlap in the first investigation. A fourth study by Lester and Traxler,[8] in which 200 blanks of 11th- and 12th-grade boys were used, exhibits appreciably less agreement between the two sets of scores.

From the point of view of use of interest scores in guidance it is important to know whether the two scoring systems will give the

[5] M. W. Richardson, "The Combination of Measures," in *The Prediction of Personal Adjustment* (Social Science Research Council, 1941), 379–401. See also S. S. Wilks, "Weighting Systems for Linear Functions of Correlated Variables When There Is No Independent Variable," *Psychometrika* (1938), **3**, 23–40.

[6] L. Kogan and F. Gehlmann, "Validation of the Simplified Method for Scoring the Strong Vocational Interest Blank for Men," *Journal of Educational Psychology*, 1942, **33**, 317–20.

[7] B. M. Peterson and J. W. Dunlap, "Derivation and Application of a Unit Scoring System for the Strong Vocational Interest Blank for Women," *Psychological Bulletin*, 1941, **38**, 607; and B. Peterson Harper and J. W. Dunlap, "Derivation and Application of a Unit Scoring System for the Strong Vocational Interest Blank for Women," *Psychometrika*, 1942, **7**, 289–95.

[8] H. Lester and A. E. Traxler, "Simplified Method for Scoring the Strong Vocational Interest Blank Applied to a Secondary-School Group," *Journal of Educational Psychology*, 1942, **33**, 628–31.

same scores in both cases. As scores are usually expressed by letter ratings, comparisons have been made by Dunlap and his co-workers in terms of such ratings. The extent to which the scores by the two methods have (*a*) agreed, differed by (*b*) one letter rating (e.g., B to B+) and (*c*) by two letter ratings (e.g., B to A) are as follows, expressed in percentages:

Researches	Sex	Agreement	Change of One Rating	Change of Two Ratings
Peterson and Dunlap	Men	72.5	26.3	1.2
Kogan and Gehlmann	Men	74.2	24.8	1.0
Harper and Dunlap	Women	76.6	22.5	0.9
Harper and Dunlap	Women	77.9	20.9	1.2
Lester and Traxler	Men	67.7	32.0	0.3

Following the publication of Dunlap's first research an extensive investigation was planned along the same lines. Many factors have prevented completion of this work, but enough data have been accumulated at the time of reading the galley proof of this chapter to be considered here. Revised weighted and corresponding unit scales have been prepared for four women's occupations using criterion groups of at least 400 blanks. Various blanks have been scored on three such pairs of scales. When scores on the weighted and corresponding unit scales are compared we have for 2,343 cases the following.

Percentage of cases with no change in letter rating	69.8
Percentage with a change of one-letter rating (e.g., B— to B)	24.6
Percentage with a change of two-letter ratings (e.g., B— to B+)	5.2
Percentage with a change of three-letter ratings (e.g., B— to A)	0.4

These figures do not demonstrate so good an agreement in scores between weighted and unit scales as is reported by Dunlap and his associates except in the case of Lester and Traxler, whose data approximate our own. Even when C, C+, and B— ratings are ignored there still remain 19.9 per cent change of one-letter rating, 3.1 per cent change of two-letter ratings, and 0.3 per cent change of three-letter ratings.

The actual situation is much worse than the averages above indicate for the percentage of "no change" varies from 92.5 per

cent (librarians on librarian scale) to 26.0 per cent (librarians on physician scale).

The discrepancy between our data and those of Dunlap and his associates is disturbing. There is, of course, a very real difference in our procedures. In our case critical scores separating one letter rating from another are determined directly from the standard deviation of the scores of the criterion group. This is true not only for the weighted scales but also for the corresponding unit scales. Dunlap, on the other hand, had no way of determining critical scores for letter ratings on the unit scales except to calculate them from the critical scores of weighted scales using his regression equations. Such calculated critical scores should give greater agreement between the two sets of scores than would be obtained by using critical scores based on the scores of a criterion group. Comparisons have been made with three samples totaling 920 cases upon weighted and unit physician scales where the critical scores for the unit scales were based upon the standard deviation of the criterion group in the first instance and upon regression equations in the second instance. There is an increase in agreement from 67.2 to 70.5 per cent. The difference of 3.3 per cent does not, however, equal the difference between our percentage of agreement of 69.8 and the average percentage of agreement of the four studies of Dunlap and his associates which is 75.3, a difference of 5.5 per cent. But if the data of Lester and Traxler are given equal weight with the other four studies then the difference in agreement between the five studies and ours, i.e., 4.0 per cent, approximates the difference of 3.3 per cent and suggests that the superior agreement reported in the five studies is an artifact caused by the use of faulty critical scores.

Taking the foregoing into account, we believe that the unit scales which are used here will give complete agreement with weighted scales in about 70 per cent of cases when norms are based, as they should be, upon distributions of scores of criterion groups.

A better measure of the relative value of weighted and unit scales is to be found in the amount of overlapping between two occupational groups. Of two scales that one is to be preferred which separates to the greater degree one ocupation from another.

The following data show that weighted scales are superior to unit scales in this respect.

Scale	Group	Percentage of Overlapping	
		Weighted Scales	Unit Scales
Physician	Home economics	24.5	31.0
Physician	Librarian	31.0	47.0
Home economics	Physician	10.0	15.0
Home economics	Librarian	13.5	16.5
Librarian	Physician	50.5	56.0
Librarian	Home economics	24.5	30.0
Average		25.7	32.6

This difference between weighted and unit scales is not so large as that shown in Table 159. But both sets of data demonstrate that weighted scales differentiate criterion groups better than the unit scales that have been employed in these studies. Moreover, the reliability of the weighted scales averages .015 higher than the unit scales.

The conclusion must be at this time that if maximum differentiation is desired, weighted scales should be used in preference to unit scales such as are used above. And seemingly if weighted scales differentiate occupations better than unit scales they should also provide better scores for vocational counseling. We do not know, but we can surmise, that the differences in ratings between the two types of scales which all investigators have found are expressions of the differences in the two scales as regards differentiation of occupations.

Granting the foregoing, there is still a very fundamental issue to be faced—an issue that cannot be settled by statistics. Shall we insist upon maximum accuracy with present cost of scoring or content ourselves with less accuracy and half the cost?[9]

[9] Reduction in weights below ±4 would not significantly reduce labor in scoring with the International Business Machines tabulator (Hollerith machine), for the size of weights is immaterial. With hand scoring stencils can be made using weights from −4 to +4, which are equivalent to the Hollerith weights from 1 to 9. When this is done, all the values to be tapped out on two Veeder Counters are small, and experienced scorers find that the mental task of perception, rather than the motor task of tapping, is the factor limiting scoring speed. Hand scoring without use of Veeder Counters would be facilitated by reduction in size of weights. Scoring on the IBM Test Scoring Machine would be materially reduced, as only two stencils would be needed instead of four. There would also be a reduction in labor in scoring on the IBM Counting Sorter.

Dunlap argues for the simpler scoring procedure because it permits testing more people. He writes:

> I sincerely believe that this is a real advantage from the practical standpoint. It makes the test more useable, decreases the cost of scoring tremendously, and I believe, will not seriously reduce the efficiency of the test. In fact the possibility of reducing the cost of scoring by sixty to seventy per cent seems to me to more than offset the slight loss in efficiency that may occur and that the total human benefit due to the spread of the test to larger numbers will be greater.[10]

Another correspondent stresses the desirability of making unit scales available for the *Vocational Interest Blank*, else some people will use inferior tests which are easy to score.

If the present cost were one hundred dollars, some decreased accuracy might be justified for the sake of cutting the cost in half. But when the present cost is a dollar, one wonders about saving fifty cents at the expense of inaccurate counseling to some people. Is it worth the chance of error?

OPTIMUM NUMBER OF ITEMS

The number of items has been increased from the earliest blank of Moore with 20 items to that of Freyd's blank with 201 items, to Cowdery's blank with 263 items, and finally to Strong's blank with 420 items (original form for men). Strong's revised blanks for men and women have 400 items, the maximum number that can be scored with two runs through the Test Scoring Machine of the International Business Machines Corporation. Has this increase in number of items been necessary?

Obviously the fewer the items the easier it is to fill out the blank and also to score it. From this point of view the fewer the number of items the better.

An analysis of the weights that items have on the different occupational scales makes clear that each item aids in differentiating certain occupations but not others. A good interest blank needs accordingly a great variety of items and this means many items. Table 160 shows that the situation described is true also of types of items. The 53 items dealing with peculiarities of people, for example, contribute very little to the total score in the case of

[10] Letter to the writer, October 6, 1941.

lawyers and especially architects (correlation between the scores on these items and the total score is .20 in the former case and .07 in the latter), but they are distinctly useful in differentiating life insurance salesmen, real estate salesmen, and ministers (correlations, respectively, of .63, .45, and .49).

TABLE 160

CORRELATION BETWEEN PARTS OF VOCATIONAL INTEREST BLANK (OLD FORM) AND ENTIRE BLANK OF 420 ITEMS*

Entire Blank vs. Parts	184 Lawyers	100 Architects	100 Life Insurance Salesmen	98 Real Estate Salesmen	100 Ministers
Part I*a*, 50 occupational items	.86	.75	.63	.79	.72
Part I*b*, 50 occupational items	.83	.67	.63	.83	.75
Part II, 54 amusements	.68	.34	.60	.15	.67
Part III, 39 school subjects	.45	.50	.44	.60	.45
Part IV, 52 activities	.75	.66	.75	.51	.56
Part V, 53 peculiarities of people	.20	.07	.63	.45	.49
Part VI, 40 order of preference of activities	.41	.62	.49	.40	.41
Part VII, 42 comparison of items	.42	.56	.50	.52	.31
Part VIII, 40 present abilities	.32	.04	.55	.56	.20
Parts I*a* and I*b*, 100 occupational items	.87	.84	...	...	...
Parts II–VIII, 320 items	.87	.87	.95	.83	.82
Parts I*a*, I*b*, and II, 154 items	.90	.85	...	...	...
Parts I*a*, I*b*, II, and III, 193 items	.94	.88	...	...	...
Parts I*a*, I*b*, II, III, and IV, 245 items	.96	.92	...	...	...
Parts I*a*, I*b*, II, III, IV and VI, 285 items	.97	.95	...	...	...
Parts I*a*, I*b*, II, III, IV, VI, VII, 327 items	.99	.97	...	...	...
Parts I*a* vs. Part I*b*	.79	.41	...	...	...

* Professional men scored on scales of their own occupation.

Burnham concluded that

> each of the eight parts contributes independently to the sampling of the whole field of "interests" and . . . . if the blank is to be further stabilized, it would be well to experiment with the inclusion of additional "unitary parts" to provide an increase in the breadth of the sampling.[11]

From the standpoint of reliability many items are desirable, for a survey of various tests indicates that the obtained reliabilities

[11] P. S. Burnham, "Stability of Interest Test Scores" (unpublished Doctoral dissertation, Yale University, 1935), p. 72.

increase with the number of items approximately as the Brown-Spearman formula postulates. Increasing the number of items increases the labor of figuring out "appropriate" answers. The difficulty of fudging is furthermore increased by including items which do not have any obvious relationship to the desired occupational rating. (See p. 683.)

Many recent investigations have emphasized the value of item validity as a factor in test validity. The data of Dunlap[12] suggest that the number of items can be appreciably reduced by selecting those that definitely predict one field of interest and only slightly or not at all other fields of interest. That is possible when a test is scored for one or for at the most only a few factors. How far this can be done with a blank which is scored for interest in many occupations is unknown.

There are two ways by which the task of scoring the test by hand[13] might be shortened through reducing the number of items to be scored without at the same time reducing the number of items on the blank. First, only items which are "liked" might be scored, thereby reducing the number of items to be weighted by about two-thirds; and, second, only items with positive weights might be scored, thereby also reducing the number of items to be scored by about one-half. The exact situation for the policeman scale is given in Table 161. Out of a possible 1,200 weights, 530 are zero, leaving 670 weights actually to be considered. If only "like" responses are to be scored, there will be a saving of 61 per cent of the 670 actual weights; if only "like" and "dislike" responses are to be scored, the saving is 29 per cent; if only plus weights are to be scored, the saving is 50 per cent.

Scoring only likes, or only likes and dislikes.[14]—When 120 men from three different occupations were scored on five scales—first, on standard scales and, second, on scales utilizing only like responses—the correlations between the two ranged between .75

[12] J. W. Dunlap, "The Predictive Value of Interest Test Items for Achievement in the Various School Subjects," *Journal of Applied Psychology* (1935), **19**, 53-58.

[13] What follows in this section does not apply to machine scoring, for in that there is no saving by eliminating certain items on one scale but not on all scales.

[14] E. K. Strong, Jr., and H. J. Green, "Short Cuts to Scoring an Interest Test," *Journal of Applied Psychology*, 1932, **16**, 1-6.

and .95 and averaged .85. Such correlations are too low to warrant using the short-cut scales instead of the standard scales.

TABLE 161

DISTRIBUTION OF WEIGHTS ON POLICEMAN-INTEREST SCALE

Weight	Like	Indifferent	Dislike	Total	
4	9	...	...	9	
3	12	...	1	13	337 plus weights
2	35	6	4	45	
1	88	127	55	270	
0	142	204	184	530	530 zero weights
−1	92	51	107	250	
−2	19	11	33	63	333 minus weights
−3	2	1	10	13	
−4	1	...	6	7	
Total	400	400	400	1,200	

When scores from scales based on only "like" and "dislike" responses were correlated with scores from standard scales, the coefficients ranged between .908 and .987 and averaged .96. The reliability of the short-cut scales has not been calculated but undoubtedly would be less, since the scales are based on approximately one-third less items. Validity, measured by differentiation between occupations, is also slightly less: in eight cases among twelve the standard procedure gives better differentiation; in one case the differentiation is the same; and in three cases the short-cut scales give better separation. The relatively slight decrease[15] in scoring time from disregarding indifferent responses, a saving applicable only to hand scoring, does not seem warranted at the expense of decreased reliability and validity.

Scoring only plus weights.—When scores on scales using only plus weights are correlated with scores based on standard scales, the resulting coefficients range between .91 and .96 and average .94. Unexpectedly, the plus-weight scales differentiate occupations slightly better, the average difference between 22 comparisons amounting to .14 of a critical ratio. Decreasing the number of items by approximately half reduces, however, the reliability

[15] In terms of the policeman scale (Table 161) 196 weights are eliminated from among 1,200, a saving of only 16 per cent.

from .86 to .818 in the case of nine scales. This rather considerable decrease in reliability more than offsets the very slight increase in validity of the short-cut method.

Summary.—The three studies make clear that it is not advisable to short-cut the hand scoring by scoring only likes. Scoring only likes and dislikes but not indifferences is a possibility in which a slight saving in time in hand scoring has to be offset against a slight loss in validity and reliability. Scoring only plus weights would result in an appreciable saving in time of hand scoring with no loss in validity but appreciable loss in reliability. There is no saving in scoring time by any of these short-cut methods when that is done on a machine.

The attention to short-cut procedures and approximations has been excessive. Too many workers have offered substitute procedures which are supposedly "just as good." Until these can be shown to result in greater efficiency, such as gain in time without loss in precision, they cannot be regarded as contributions. The available evidence suggests that most of the short-cut devices, aside from those mentioned above, are superficial. We have spent much time and money checking a number of these short-cuts, and have found that reliability and/or validity are usually sacrificed for convenience.

SIZE OF CRITERION GROUP

How large must a criterion group be in order to establish valid norms in an interest test?

The scoring scales used with an interest test are based upon the differences in interest between two groups. If there are only a few individuals in the given groups there would appear "by chance" many striking differences in interests which would not appear if the groups were large. Another way of considering the situation is to recall that "the scoring for the entire MF scale is based on only 13.5 per cent of the responses of the two sexes, since the two sexes agree in 86.5 per cent of their responses to all the items" (p. 72). Even with samples of 400 of each sex the weight for each item is on the average based upon the differences of only 54 men and 54 women. It is easy to imagine chance differences appearing under such conditions; it must be remem-

bered, however, at the same time, that the larger the population the more likely that such chance responses will be neutralized by other chance responses in the reverse direction. It is consequently quite important to determine how large the criterion group must be in order to eliminate purely chance differences in interests.

Very small samples were utilized in the first researches concerning interests.[16] In the early exploratory years of our own investigation it was deemed sufficient to use 100 cases. Later on 250 cases were considered enough to give satisfactory results. Certain investigations of the writer and particularly the research of Manson[17] supported this conclusion. In consequence effort was made in revising the men's blank to secure at least that number of cases. The following pages outline the growing appreciation of the fact that still larger numbers of cases are needed to insure the minimum of error in this type of test.

Manson.—The first person to use consistently large criterion groups was Manson: eight of her scales were based on 250 cases, the other two on 500 cases; her women-in-general group ranged in size from 7,958 to 12,886. Table 162 suggests very definitely that 250 cases are sufficient for a criterion group, since new cases obtain 97 per cent as many A ratings as the criterion groups. These results led Fryer to write:

> There is very little difference between the old and new cases in the selection made by the interest scales of those belonging to the occupations for which it was prepared. This fact would suggest that further validation of interest scales is unnecessary if the primary sample includes a total . . . . of 250 or more cases. But to make this statement positively is premature.[18]

Three years later Berman *et al.* reported ratings on the Manson scales for several hundred women, who obtained only 80 per cent as many A ratings as Manson's criterion groups. Berman and her associates commented as follows:

> It is apparent, then, that the Manson scoring keys function almost as well for occupational groups tested by the Research Institute as for the original criterion group. A notable exception is found in the results for nurses.[19]

[16] For examples, see chapters 19 and 20.

[17] G. E. Manson, "Occupational Interests and Personality Requirements of Women in Business and the Professions," *Michigan Business Studies* (1931), Vol. 3, No. 3.

[18] D. Fryer, "Validating Measures of Interest," *Personnel Journal* (1932), 11, 106.

[19] I. R. Berman, J. G. Darley, and D. G. Paterson, *op. cit.*, p. 25.

But, even if the data on nurses are excluded, the new cases obtained only 83.8 per cent as many A ratings as Manson's criterion groups. We do not know how much of this discrepancy of 16 per cent is to be attributed to differences in standard of sampling, how much to the fact that comparisons are based upon samples of only 50 cases, and how much to the possibility that scales based on 250 cases are not sufficiently accurate.[20]

TABLE 162

PERCENTAGE OF A RATINGS OBTAINED BY MANSON'S CRITERION GROUPS OF 250 CASES EACH AND BY 100 ADDITIONAL CASES OF MANSON AND BY VARYING NUMBERS OF CASES FROM MINNESOTA

Occupational Groups	50 Cases from Criterion Group	100 Additional Cases of Manson[a]	Ratio between the Two	Research Institute Cases[b]	Ratio between Manson Criterion Groups and Research Institute Cases
Private secretary	70	73	104.3	..	....
Bookkeeper	74	75	101.4	53	71.6
Stenographer	74	78	105.4	68	91.9
Office clerk	80	58[c]	72.5	53	66.3
High-school teacher	64	74	115.6	63	98.4
Grade-school teacher	76	67	88.2	68	89.5
Nurse	75[d]	..	.....	44	58.7
Retail saleswoman	46[d]	..	.....	42	91.3
Average	..	..	97.0	..	80.0

[a] G. E. Manson, *op. cit*, Tables 11, 13–17

[b] I. R. Berman, J B Darley, and D G. Paterson, *Vocational Interest Scales* (University of Minnesota Employment Stabilization Research Institute, 1934), Vol. 3, pp. 235–37.

[c] Fifty cases

[d] One hundred fifty cases.

Criterion group of 100 not large enough.—In investigations made in 1928 three lawyer scales were developed; the first was based on 274 blanks, the second on 101 blanks, and the third on 83 blanks. The 184 blanks of the last two groups were scored on the three scales. Correlations between the scores on the three scales ranged between .932 and .981. Evidently practically the

[20] The two scales of stenographer and grade-school teacher were based on 500 cases. Additional cases supplied by Manson obtained 96.7 per cent as many A ratings as the criterion groups and the cases from Minnesota obtained 90.7 per cent as many A ratings.

same rank order is obtained if the blanks of 101 lawyers are scored on a scale based upon their own records (scale L-101) as upon a scale based upon the records of another sample of lawyers (scale L-83). The same situation is obtained if the blanks of 50 mechanical engineers are scored on the three scales.

But relative position is not sufficient: absolute scores must be taken into account when differentiation between groups is to be considered. Table 163 makes clear that a group of lawyers will score higher on their own scale than on a scale based upon another sample of lawyers. (Compare distributions of 101 lawyers on L-101 scale and L-83 scale; also distributions of 83 lawyers on these two scales.) And this situation holds true when both groups are apparently equally good samples of lawyers in general, judging from their distributions on the L-274 scale. Evidently not all chance differences in interests between lawyers and men in general are eliminated by a sample of one hundred cases. If norms are based on the one hundred men for whom the scale is developed, they will be too high for a second group of one hundred cases.

TABLE 163

EFFECT OF SIZE OF CRITERION GROUP UPON DISTRIBUTION OF RATINGS*

Rating	Quartile Score	274 Lawyer-Scale		101 Lawyer-Scale		83 Lawyer-Scale	
		101 Lawyers	83 Lawyers	101 Lawyers	83 Lawyers	101 Lawyers	83 Lawyers
A	2	3	6	0	1	7	1
A	1	25	27	25	15	11	25
A	0	50	48	50	36	38	50
A	−1	71	79	75	67	60	75
B+.....	−2	92	97	91	92	81	93
B	−3	99	99	99	98	95	99
B−	−3.5	100	100	100	100	99	100

* Figures are percentages of the two groups who score above 3Q, 2Q, 1Q, median, etc., on the three scales.

It would appear, then, that only about 64 per cent of a second sample will rate A instead of 75 per cent on original scales when the norms are based on the first sample of one hundred cases. There are, however, practically the same percentage rating above C in both cases.[21]

[21] This conclusion is supported by a similar contrast between two groups of 94 ministers each.

Table 164 illustrates another aspect of the effect of size of criterion groups, namely, men in other occupations do not obtain many high ratings when the scale is based on a small criterion group. Increasing the criterion group from 83 to 274 cases gave twice as many A ratings and over three times as many ratings above C. All this means that the smaller the criterion group the greater the differentiation that will be found between groups.[22]

TABLE 164

PERCENTAGE OF MEN IN SIX OCCUPATIONS WHO RATE A, AND A AND B, IN INTERESTS OF A LAWYER, ACCORDING AS THE NORMS ARE BASED ON 274 OR ON 83 LAWYERS

Occupations	274 Lawyer-Scale		83 Lawyer-Scale	
	A[a]	A and B[b]	A	A and B
Public accountants	31	96	6	26
Artists	24	94	2	11
Life insurance salesmen	15	87	10	28
Ministers	14	86	6	23
Personnel managers	9	78	26	57
Engineers	5	78	0	14
Average	16.3	86.5	8.3	26.5

[a] Above −Q
[b] Above −3.5Q.

These conclusions are based upon scales with weights ranging between +15 and −15. The following data, based upon the revised type of scale with weights between +4 and −4, show the same phenomenon. Three scales were prepared for the Forest Service based upon 158 forest supervisors, 188 district rangers, and 410 representatives of the Forest Service including the above two groups and certain other men in the service. Since there was high correlation between all three scales,[23] only the latter has been used. The supervisors and rangers rate practically the same on the general service scale (see Table 165). But on the two other scales the group constituting the criterion group upon which the

[22] When we know that contrasting two criterion groups of fifty cases each give greater differentiation than that obtained from larger criterion groups, we must consider the greater differentiation an artifact.

[23] Correlations are: supervisor vs. ranger, .90; supervisor vs. general service, .95; and ranger vs. general service, .97.

scale is based have 14.6 per cent more A ratings than the noncriterion group and they have 4.0 per cent more A and B ratings. Expressed in another way, the criterion groups average a standard score of 50, while the noncriterion groups average 45. The difference is equal to one-half a standard deviation. The next section records two extensive investigations to determine how differentiation is affected by scales ranging in size from 50 to 500 cases.

TABLE 165

COMPARATIVE RATINGS OF TWO GROUPS ON A SCALE BASED NEARLY EQUALLY UPON BOTH OF THEM, A SCALE BASED ONLY UPON THE FIRST GROUP, AND A SCALE BASED ONLY UPON THE SECOND GROUP

Rating	Theoretical Expectancy in Percentage	General Forester's Scale N = 410		Supervisor's Scale N = 158		Ranger's Scale N = 188	
		158 Supervisors	188 Rangers	158 Supervisors	188 Rangers	158 Supervisors	188 Rangers
A	69.2	67.6	69.6	71.5	58.5	55.7	71.8
A to B	97.7	96.2	95.2	97.5	89.4	93.7	96.3

Engineering scales based on 50 to 500 cases.—Eleven groups of engineers were constituted of 50 cases each. Care was taken that in each group there would be approximately equal representation of civil, electrical, mechanical, and mining engineers, both active and associate members of the four engineering societies; also men of equivalent age and equivalent score on the original engineering interest scale.[24] Nine scales were developed, ranging in size from 50 to 500 cases, as indicated in Table 166.

As the criterion group upon which a scale is based is increased in size, the correlations between scores on such scales and scores on a scale based upon 500 cases increase in size from about .85 (scale of 50 cases) to about .987 (scale of 400 cases). Many would assume that a scale based on 150 cases is sufficient when they note the size of the resulting coefficient of .956. Data given below demonstrate that considerable error may be present with a coefficient of that size. That this is possible is easily seen when

[24] Groups A and L, for example, averaged, respectively, 279 and 287 on the old engineering scale and 105 and 107 on the revised scale. The average raw score of 503 engineers on the revised scale is 109.3.

correlations are converted into coefficients expressive of forecasting efficiency, using the formula, $E = 1 - \sqrt{1 - r^2}$. A criterion group of 400 forecasts the results to be obtained with a group of 500 nearly twice as well as does a criterion group of 50 (.839 vs. .475). There is an increase of forecasting efficiency from .71 with a criterion group of 150 cases to .74 with a criterion group of 250 cases, to .80 with a criterion group of 300 cases, and to .84 with a criterion group of 400 cases. The high correlations in Table 166 do indicate that rank order of scores is well established by scales based on 250 cases. Mean scores must be considered as well as rank order.

TABLE 166

CORRELATION BETWEEN SCORES ON SCALES RANGING FROM 50 TO 400 CASES AND SCORES ON SCALE AK OF 500 CASES*

Groups	Scale A (50)	Scale AB (100)	Scale AC (150)	Scale AD (200)	Scale AE (250)	Scale FK (250)	Scale AF (300)	Scale AH (400)
Group A.	.824	.909	.954	.960	.958	.969	.973	.983
Group L.	.878	.926	.958	.975	.973	.961	.987	.990

* Group A is included in all criterion groups except FK; Group L is not included in any criterion group

The effect of increasing the size of the criterion group upon scores is shown in a variety of ways. In considering the data there are two comparisons to be noticed particularly, i.e., between Groups A and L and between Groups AE and FK. Groups A and L are both composed of 50 cases; but whereas the former is included in the various criterion groups upon which the scales are based, except FK, the latter is not included in any scale. Group A should receive higher engineering-interest scores than Group L to the extent that membership in the criterion groups causes higher scores. Similarly Groups AE and FK are both composed of 250 different cases, the former affecting all the scales except FK, whereas the latter does not affect the first five scales, i.e., A, AB, AC, AD, and AE.

The mean raw scores of blanks of criterion groups on their own scales decrease in size as the criterion group increases in

size from 50 to 500 cases; and the standard deviation increases in size up to scales of 200 cases. (Table 167, which gives the data, is to be read as follows: The 50 cases comprising scale A have a mean raw score of 261.6 on scale A; the 100 cases comprising scale AB have a mean raw score of 246.7 on scale AB; etc.)

TABLE 167

MEAN SCORES AND STANDARD DEVIATIONS OF THE NINE ENGINEERING SCALES

Number of Cases	Scale	Composed of Groups	Mean	Sigma	Critical Ratio of Difference between This Mean and That of AK[a]
50	A	A	261.6	30.53	9.2
100	AB	A, B	246.7	40.17	8.9
150	AC	A, B, C	242.2	44.13	6.1
200	AD	A, B, C, D	237.3	45.99	5.4
250	AE	A, B, C, D, E	236.7	43.83	6.6
300	AF	A, B, C, D, E, F	232.1	45.75	5.0
400	AH	A, B, C, D, E, F, G, H	223.5	45.85	0.2
500	AK	A, B, C, D, E, F, G, H, J, K	223.7	45.33	...
250	FK	F, G, H, J, K	228.8	46.81	2.4

[a] Since the first seven groups are contained within the eighth group, which is here viewed as "the universe," the following formula was used to calculate the standard deviation of the means of the first seven groups:

$$\sigma_m = \frac{\sigma}{\sqrt{N}}\sqrt{1 - \frac{N}{N'}}$$

where N refers to the subsample, and N' to the entire sample, i.e., 500. See Q. McNemar, "Sampling in Psychological Research," *Psychological Bulletin* (1940), Vol. 37, p. 334.

Table 168 gives the mean standard scores of six samples on the nine engineering scales. Sample A, which is included in all the scales, scores highest on its own scale quite naturally and one standard score lower on the remainder except AD and FK, where the difference is two to three standard scores greater.

The reverse situation holds for blanks which are not included in the criterion group: here the mean score increases in size as the criterion groups increase in size from 50 to 500 cases. For example, Group L averages 37 standard score when scored on scale A of 50 cases, 45 standard score on scale AB of 100 cases, 48 on scales AE and FK of 250 cases, and 49 on scale AK of 500 cases.

Similarly 100 lawyers increase their mean standard score from 5 on scale A to 25 on scale AD of 200 cases and to 26 on scale AK of 500 cases.

TABLE 168

MEAN STANDARD SCORES* OF GROUPS A, L, AE, AND FK, AND OF 100 LAWYERS AND 100 PHYSICIANS ON THE NINE ENGINEER SCALES

Scale Based on N Cases	Scale Based on X Group	Average Standard Score					
		A	L	AE	FK	Lawyer	Physician
50	A	50	37	38	37	5	18
100	AB	49	45	47	45	18	29
150	AC	49	46	48	47	22	33
200	AD	48	47	48	47	25	34
250	AE	49	48	50	48	25	34
300	AF	49	48	50	49	25	36
400	AH	49	48	49	49	26	35
500	AK	49	49	50	50	26	35
250	FK	47	48	48	50	26	35

* Standard scores have been calculated for each of the nine scales; consequently Group A averages 50 on Scale A, Group AE averages 50 on Scale AE, etc

The effect upon the mean score, produced by including or not including the sample in the criterion groups upon which the scale is based, is strikingly shown by comparing the mean scores of samples A and L of 50 cases each. On scale A of 50 cases the difference in standard scores is 13, on scale AB of 100 cases the difference is 4, and on scales AD of 200 cases to AH of 400 cases the difference is one standard score.

We should conclude from these data that the error in using a criterion group of 250 instead of 400 or 500 cases amounts to one standard score judging from the data from both lawyers and physicians and amounts to one, possibly two standard scores, judging from the data from samples A and L. This error is increased to from two to eight standard scores with a criterion group of 100 cases and to larger amounts with a criterion group of 50 cases. These results are graphically shown in Figure 51, based upon the foregoing data and in addition upon the data from 585 osteopaths which have been handled in similar fashion. The average of the five sets of data indicates an error of 5.5 standard scores with a

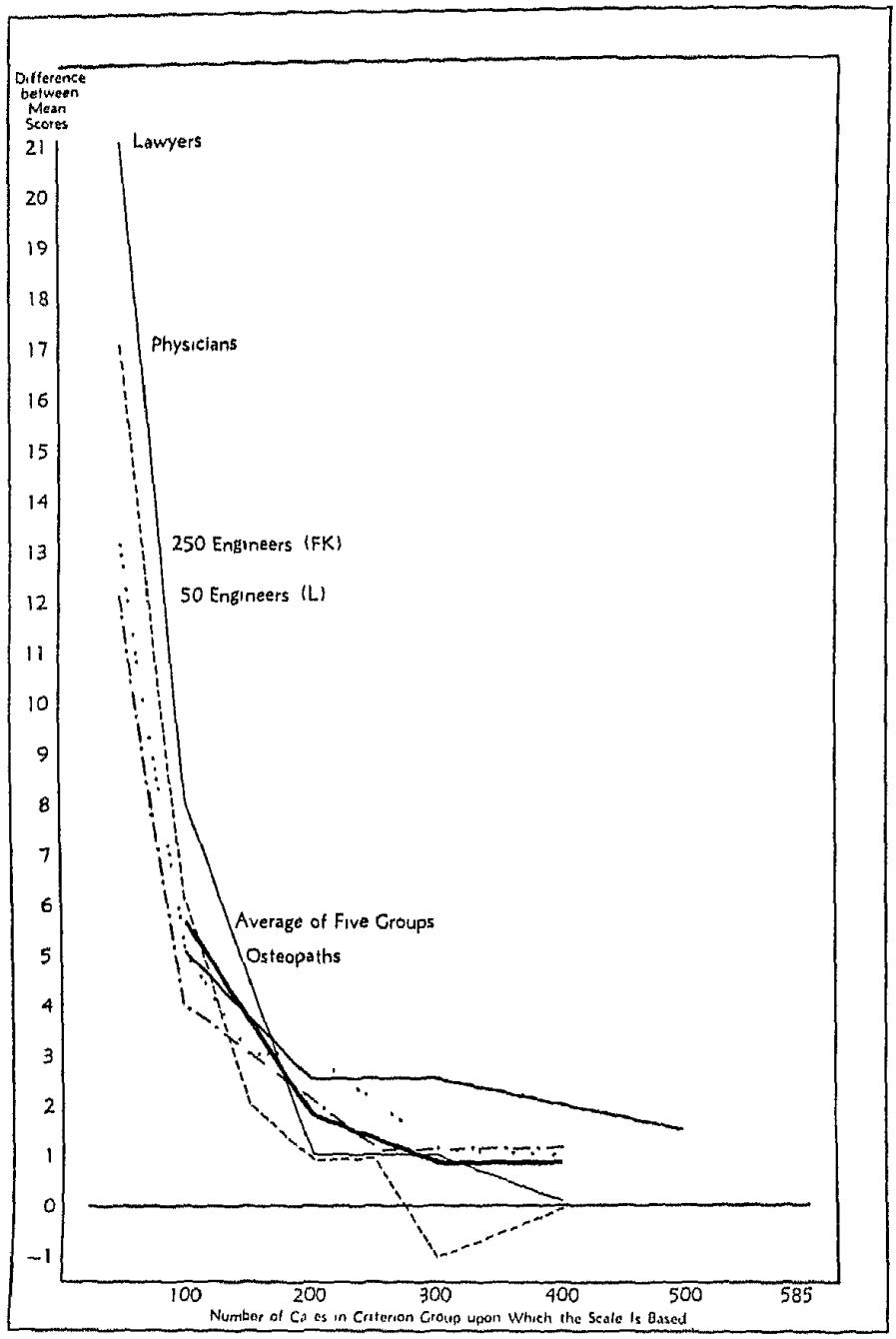


FIG. 51.—Differences in mean standard score of (*a*) lawyers, (*b*) physicians, (*c*) engineers, in group FK, and (*d*) engineers in group L when scored on Scale AK based on 500 cases, on the one hand, and on Scales A, AB, AC, AD, AE, AF, and AH based on 50 to 400 cases, on the other hand.

Also differences in mean score of 85 osteopaths when scored on a scale based on 585 osteopaths, on the one hand, and on scales based on 100, 200, 300, 400, and 500 osteopaths, on the other hand.

scale of 100 cases, an error of 2 standard scores with a scale of 200 cases, and an error of 0.9 standard score with a scale of 300 cases.

Another basis for determining the error which arises from using scales composed of too few cases is to compare the percentage of overlapping between samples from two different occupations. Table 169 gives the percentage of overlapping between the scores of 100 lawyers and of four samples of engineers, i.e., A, L, AE,

TABLE 169

PERCENTAGE OF OVERLAPPING OF ENGINEERS IN GROUPS A, L, AE, AND FK, AND LAWYERS ON THE NINE ENGINEERING SCALES

Scale Based on N Cases	Scale Based on X Group	Groups			
		A	L	AE	FK
50	A	9.6	25.5	29.2	33.2
100	AB	15.2	24.3	25.8	30.4
150	AC	15.8	22.6	25.4	29.5
200	AD	18.9	24.1	26.8	32.3
250	AE	17.9	22.3	24.1	29.0
300	AF	19.5	22.5	26.0	28.6
400	AH	20.3	22.4	27.0	28.0
500	AK	20.9	21.5	25.8	27.5
250	FK	24.5	22.1	27.9	26.0

and FK, when scored on the nine scales. The data from this table and a similar table involving physicians, not published, have been averaged and the resulting figures smoothed by the moving-average procedure. The latter figures are presented in Figure 52. According to curves 1 and 2 the "true" amount of overlapping is 33 per cent, assuming that a scale of 500 cases is ample, and according to curves 3 and 4 the "true" amount is 37.7 per cent. There is no way of telling which amount is correct, but the latter is preferred because it is based upon data from two samples of 250 engineers each instead of upon two samples of 50 engineers each. There are three elements to be taken into account. First, the larger the criterion group the more nearly the ascertained differentiation between two occupations approaches the "true" differentiation (overlapping). Second, a large sample gives less differ-

entiation (greater overlapping) than a small sample (compare curves 3 and 4 with curves 1 and 2). Third, when the sample is contained in the criterion group differentiation is greater (overlapping less) than when the sample is not so contained. Compare curve 1 with 2; also curve 3 with 4. In other words, differentiation between two occupations cannot be accurately determined by scoring both on a scale based on less than 250 cases, and especially when the sample used is contained within the original cri-

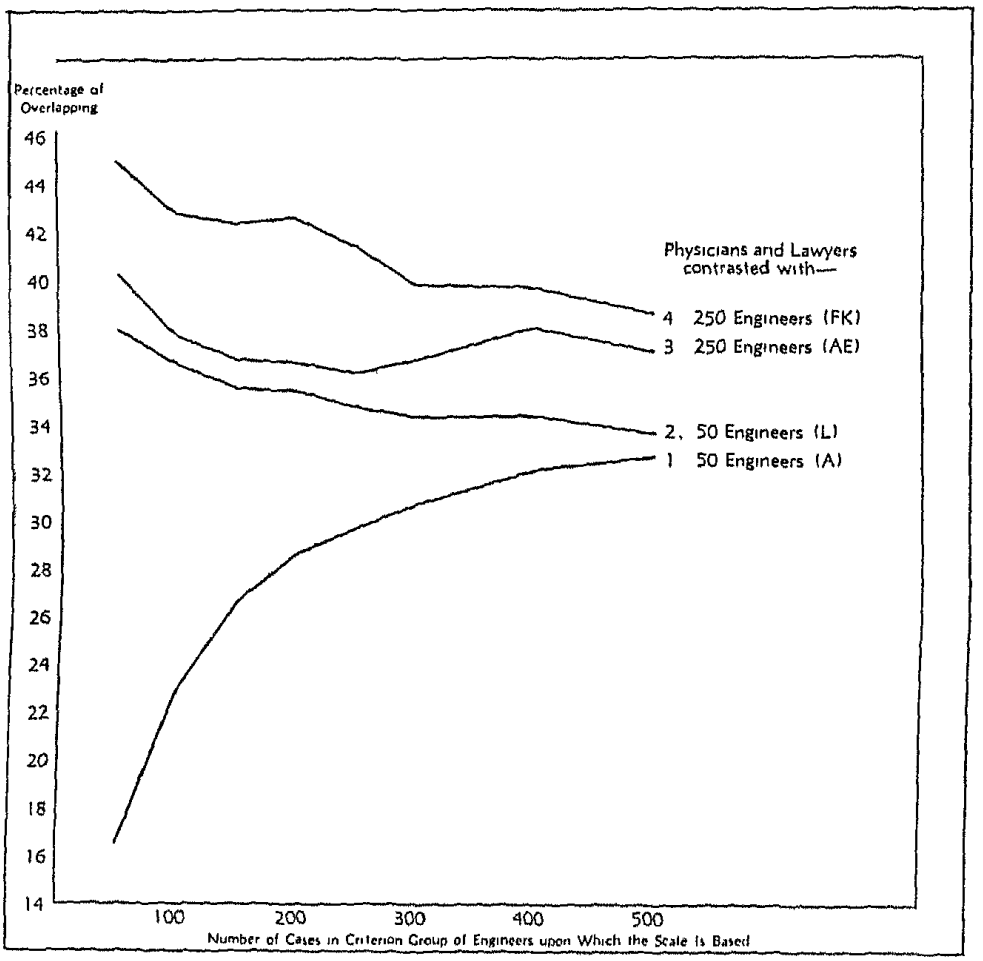


FIG. 52.—Percentage of overlapping between interest scores of lawyers and physicians averaged and the scores of four groups of engineers, i.e., A, L, AE, and FK, when the contrasting groups are scored on engineering scales based on 50 to 500 cases. Curves are smoothed by moving average procedure.

terion group. The difference between the ascertained and the "true" differentiation between two occupations scored on a scale based on 250 cases is about 5 per cent in terms of overlapping; this difference is reduced to about 3 per cent with a scale based on 300 cases, and to about 1.6 per cent with a scale based on 400 cases. It is of course quite possible that 500 cases are not enough: if this is so, the errors indicated are too small.

The revised men's scales give a larger number of high ratings than the original scales. Part of the explanation is to be attributed to the fact that the revised scales are based on larger samples and according to the foregoing should give less differentiation. A high score on one scale is consequently more likely to be accompanied by high scores on other scales than was true of the original scales.

(Lest some reader may gain the impression that differentiation of engineers and lawyers is actually at stake in this discussion, critical ratios have been calculated for the differences in mean scores of the two occupations. They range between 14.2 and 20.3.)

Summary.—Criterion groups of 300 to 500 are needed for the development of interest scales in order to decrease otherwise appreciable sampling errors. The discussion in this section has had to do with scales based upon criterion groups of varying sizes contrasted with a men-in-general group of nearly 5,000 cases. Usually when a scale is based on 50 cases it means that 25 cases are contrasted with 25 other cases or that the 50 cases are contrasted with 50 other cases. Such a condition is very different from ours, for in this investigation the men-in-general group was beyond suspicion as far as size is concerned. We imagine that the scales reported in many researches based on only 50, 100, or even 200 cases all told would prove to be far from satisfactory if thoroughly tested, since both of the contrasting groups are too small according to the results given above.

This investigation was completed after the revision of men's scales was finished. It now appears that if the scales were based on 300 cases instead of 250 cases the sampling error would be decreased from about 1.5 standard scores to 0.9 standard score (Figure 51), and the overlapping between engineers and another occupation would be more accurately determined by about 2 per

cent. Scales based on 400 or even 500 cases would give still better accuracy.[25]

Scales based upon small criterion groups result in far greater differentiation than is warranted.

One practical consideration may well be mentioned in closing this section. If one has available data on 200 or on 500 cases, is it better to build a scale on half of these and develop the norms from the other half, or to use all the cases for constructing the scale and base the norms also on the same cases? All the data suggest that the larger the criterion group upon which the scale is based the better. The second procedure is therefore preferable.

[25] These results explain why in the revision of the women's blank and scales the criterion groups will contain 400 cases as far as it is possible to obtain them.

Chapter 25. Stability of Interest Items

The general relationship of stability of items, reliability of interest scales, and permanence of interests has been pointed out in chapter 13. Certain data in this chapter make clear that true permanence of interests is greater than permanence as measured by the *Vocational Interest Blank.*

Because stability of items has unfortunately been measured in a number of ways, it has seemed necessary to consider what these methods are and their relationship to one another before discussing the amount of stability that has been measured in various investigations.

METHODS OF MEASURING STABILITY OF INTEREST ITEMS[1]

Changes in reaction to one or more interest items have been expressed in seven different ways: (1) change in liking, (2) change in indifference, (3) change in disliking, (4) change in total attitude, (5) percentage of identical responses, (6) number of shifts to make the first response equal to the second, and (7) coefficient of stability.

In all that follows it should be remembered that we are dealing with percentages in the three-category distributions. Certain of the statistical procedures used here are valid only when the sum of likes, indifferences, and dislikes equals 100 in all the distributions, which is the case when percentages are used.

Changes in likes, dislikes, and indifferences.—Considering the reactions of 25- and 55-year-old men to the item "actor," we find the following percentages:

Group	Likes	Indifferences	Dislikes
25-year-old men	27	32	41
55-year-old men	16	35	49

[1] This section is a revision of material first published in *Change of Interests with Age* (Stanford University Press, 1931), pp. 36–40.

There are here indicated (1) a decrease of 11 per cent in liking, (2) an increase of 3 per cent in indifference, and (3) an increase of 8 per cent in disliking. Each of these has its own specific significance.

Changes in attitude.—To obtain a single figure to represent the change from one three-category distribution to another is not as easy as it is to express changes in any one of the three phases of interest separately. One way of doing this is to assume that the difference between liking and indifference is equal to the difference between indifference and disliking. Liking may then be given a weight of 1, indifference a weight of 0, and disliking a weight of —1. The percentages of likes, indifferences, and dislikes in a three-category distribution may then be multiplied by these weights and the three products added, giving a final *index of attitude* where a plus score signifies an attitude of liking, a minus score one of disliking. The index of attitude may be obtained more easily by merely subtracting the percentage of dislikes from that of likes. Thus, in the case above, the attitude index of young men to the item "actor" is 27 minus 41 or —14, and that of older men 16 minus 49 or —33. In other words, more young men and more older men dislike being an actor than like it by 14 and 33 per cent, respectively. This index of attitude gives an expression whether liking or disliking is predominant and how greatly.

The fourth measure of change in interest is to subtract the earlier index of attitude from the later. Thus, in the example above, the difference in interest of old and young men for being an actor may be expressed as —19 (—33 minus —14).

This measure of attitude takes into account liking and disliking and, indirectly, indifference, since when expressed in percentages indifference always equals 100 minus (likes + dislikes). But it does not completely take indifference into account, since, for example, the attitude of 30 per cent dislikes, 40 per cent indifference, and 30 per cent likes is equal to the attitude of 50 per cent dislikes, 0 per cent indifference, and 50 per cent likes. This is not a serious matter in this study, as there are few distributions of this latter type and most of these are in Part VIII of the *Vocational Interest Blank.*

Percentage of identical responses.—The stability or constancy

of response to a number of items is frequently expressed by the formula

$$\frac{\text{Number of identical responses on two occasions}}{\text{Number of responses}}$$

Percentage of identical responses is usually employed when two records of the same individual are compared, but there is no inherent reason why the procedure cannot be used in comparing two groups of individuals; and there are some occasions where this is of genuine use.

Number of shifts.—This sixth measure is useful in contrasting two distributions of data, of three categories each, when expressed in percentages. No assumption need be made regarding the form of the total distribution of data; but it is necessary, as in the case of the index measure of attitude, to assume that the difference between dislike and indifference is equal to the difference between indifference and like. The number of shifts equals the minimum number of persons who would have to shift their response one category step to make the first distribution identical with the second. (For example, if one distribution is 30–40–30 and the second is 29–40–31, one of those among the 31 who dislike would need to shift over to the likes, involving two shifts. If the second distribution were 28–42–30, two of those among the 42 indifferences would need to shift to the likes, involving two shifts again.) One of the chief values of this measurement is the extreme ease with which it may be calculated. All that is necessary is to add together the differences between the two dislikes and the two likes.

There are three ways of handling the data when number of shifts is to be calculated, each having a different significance. These three procedures are illustrated below (see p. 663).

In Table 50 of the writer's *Change of Interests with Age* are given the "changes in attitude" and the "number of shifts" expressing the differences in interests of 25- and 55-year-old men. The two columns of data are identical in most cases, except that changes in attitude may be positive or negative depending upon whether the change is in the direction of liking or of disliking, whereas the number of shifts is always positive, measuring as it does the number of men who change their vote. There are a few cases in this

table where these two measures do not agree. For example, in the case of the item "artist," the results in percentages are:

Group	Likes	Indifferences	Dislikes	Attitude Index
25-year-old men	29	35	36	−7
55-year-old men	27	41	32	−5

Here the change in the two attitudes is 2, meaning a change in the general direction of greater liking. But the change in the number of shifts is 6. Whenever the change in liking is an increase and at the same time the change in disliking is a decrease (or vice versa), the change in attitude will be found to equal the number of shifts; but when the changes in liking and disliking both are an increase (or both are a decrease), then these two measures will not agree, and the number of shifts will be found to be greater than the figure expressing change in attitude.

The close connection in this study between differences in attitude and number of shifts is shown by data from the 606 pairs of males and females who constituted the criterion groups upon which the MF scale is based.

Parts of Blank	Correlation between Attitudes of Men and Women	Number of Shifts between Men and Women
1. Occupations	.36	27.0
2. Amusements	.69	23.0
3. School subjects	.27	25.6
4. Activities	.28	27.3
5. People	.96	10.9
6. Preference of activities	.49	20.0
7. Comparison of items	.87	14.7
8. Present abilities	.95	9.7
Total	.71	20.8

The rank-order correlation between the two sets of data is .88.[2]

Coefficient of stability.—Burnham[3] has employed as a seventh measure of change in interest, or stability, the following formula:

$$C = (50)\left(2 - \sqrt{\frac{\Sigma d^2}{n}}\right),$$

[2] The smaller the number of shifts the greater the agreement.

[3] P. S. Burnham, "Stability of Interest Test Scores" (unpublished Doctoral dissertation, Yale University, 1935), pp. 46 f., and "Stability of Interests," *School and Society*, 1942, **55**, 332–35.

where a change from liking to indifference and from indifference to disliking, and the reverse of these two, is counted as a deviation of 1, and a change from liking to disliking and the reverse as a deviation of 2. He reports a correlation of .86 for his one-week group and .70 for his three-year group between *C* and percentage of identical responses on the basis of all 420 items on the old blank. In explanation of his formula he writes:

> Such a coefficient has the property of a definite relationship with the number of identical responses, variation in numerical size within prescribed limits (from 100 to 0) comparable to those of the Pearson product-moment correlation coefficient (except that it has no negative values) and, in addition, such a coefficient is based upon all items [categories, i.e., like, indifference, and dislike] in the distribution of responses.[4]

Number of shifts and coefficient of stability correlate .95 when the Pearson product-moment formula is used and .98 when the correlation-ratio method is employed.[5] As the relationship between the two measures of stability is slightly curvilinear, the latter coefficient is to be preferred. Evidently the two measures give approximately the same results.

The writer prefers the number-of-shifts measure because: first, it is easier to calculate; second, the scores have a very definite meaning, i.e., the number of persons among 100 who shift their responses one category; and, third, a slight change in interests is not reported as proportionally greater than a much larger change as occurs with the coefficient of stability procedure. Take, for ex-

[4] Burnham reports that other measures were tried out in this connection and found wanting for one reason or another. "Percentage of identical response . . . . does not take into consideration the difference between a shift from like to indifferent as distinguished from like to dislike. Coefficients of association . . . . were inadequate in those cases where the percentage of identity of response was high. In such a situation, so large a proportion of the cases would be concentrated in one cell of the association table as to result in a low correlation. The coefficient of mean square contingency is inapplicable because it has a maximum value of but .816 in the case of a table where the number of classes is only 3, as would be the case in these calculations. The standard deviation is not applicable because the distribution of changes in many cases is markedly skewed. In addition it would really be a measure of the degree of dispersion about the average change in response. Thus, in the case of the maximum change in response, the standard deviation becomes 0 as well as in the case of the minimum change in response."

[5] The two correlations are based on the likes, indifferences, and dislikes of 25- and 55-year-old men for items 1–50 and 194–244 as given in Table 50, of the writer's *Change of Interests with Age.*

ample, the three distributions of 100–0–0, 80–20–0, and 0–100–0. The number of shifts from the first to the second is 20 and from the first to the third is 100. The difference between the first and second in terms of the coefficient of stability is 22 (100 — 78) and between the first and third it is 50 (100 — 50).

STABILITY OF RESPONSES TO ITEMS

Stability, or constancy, has reference to the shifts in response to a given item between the original test and a retest. Such shifts may be totaled so as to express (1) the constancy of individuals upon all the items or (2) the stability of items as checked by all the persons tested.

CONSTANCY OF INDIVIDUALS

The percentages of identical responses for several groups of individuals are reported in Table 170. The first two sets of data are from Seder,[6] who had 60 women physicians and 69 life insurance saleswomen fill out both the men's and women's *Vocational Interest Blank*. She recorded the number of changes in response to the 268 items common to the two blanks. The percentage for the physicians was 17.2 and that for the insurance women, 18.9, an average for the two groups of 18.1. This gives 81.9 per cent identical responses over a period of probably not more than a day in most cases. This lack of stability cannot be attributed to a true change in interests. An explanation for it is given below in terms of the form of the *Blank*.

The third and fifth to seventh sets of data in the table are reported by Rock.[7] His one-month-interval group consisted of 437 male high-school and college students whose data were sufficiently similar to be handled as one group. His one-, two-, and three-year groups were engineering students supplied by Dr. Warren Findley of Cooper Union. From these data it appears "that the average individual of high school or college age changes his response, as

[6] M. A. Seder, "Vocational Interest Patterns of Professional Women" (unpublished Doctoral dissertation, University of Minnesota, 1938); and "The Vocational Interests of Professional Women, II," *Journal of Applied Psychology* (1940), **24**, 265–72.

[7] R. T. Rock, Jr., *op. cit.*

expressed on the test, on one third of the items when the interval between tests is one month."[8] As the interval of time between responses is lengthened, the percentage of identical response decreases from 66.6 per cent for one month to 58.4 per cent for ten years, a decrease which is surprisingly small.

TABLE 170

PERCENTAGE OF IDENTICAL RESPONSES AND CHANGES OF ONE AND TWO CATEGORIES TO INTEREST ITEMS WITH VARYING INTERVALS BETWEEN RESPONSES

Interval between Tests	Subjects	N	Percentage of Identical Responses σ		Percentage of Identical Responses in Excess of Chance Expectancy σ		Change of One Category	Change of Two Categories
1 day.....	Women physicians[a] ...	60	82.8					
1 day.....	Insurance saleswomen[a]	69	81.1					
1 month..	H.S. and college[b]	437	66.6	7.1	30.0	6.9		
1 year.....	College freshmen[c].....	25	65.6				32.0	2.7
1 year....	Cooper Union[b]	81	64.3	5.7				
2 years ..	Cooper Union[b]	141	59.1	6.3	25.2	5.8		
3 years ..	Cooper Union[b]	50	58.5	4.6				
3½ years ..	College freshmen[d]	8	62.0				34.2	3.8
5 years ..	College seniors	25	60.7				33.5	5.8
6 years ..	High school juniors ..	25	52.6				39.2	8.2
10 years ..	College seniors	25	58.4				35.7	5.9
1½ years ..	Adult ministers[e]	61	71.0				26.0	3.0
1½ years ..	Adult C.P.A.[e].....	32	71.0				23.0	5.0

[a] Averages calculated from data in Seder's thesis. See M A Seder, *op cit.*

[b] R T. Rock, Jr., "A Study of the Constancy of Response to the Items of the *Strong Vocational Interest Blank*," *Psychological Bulletin* (1934), Vol. 31, pp 705–6. The paper, of which the bulletin article is an abstract, has not been published but has been lent to the writer for use here.

[c] Detailed data given in Tables 171 and 172

[d] C. F. Glass, "An Investigational Analysis of Certain General and Specific Interests of Engineering Students" (unpublished Doctoral dissertation, Purdue University Library, 1934).

[e] E. K. Strong, Jr., and H. MacKenzie, "Permanence of Interests of Adult Men," *Journal of Social Psychology* (1930), Vol. 1, pp 152–59.

If the responses of an individual were distributed evenly among the three categories, the correction for chance agreement would be 33⅓ per cent. But if the distribution varied from this, the chance

[8] Shuttleworth reports 62.4 per cent identical responses for 38 college students on his University of Iowa Assayer Test for an interval of 5 weeks; see F. K. Shuttleworth, "The Measurement of the Character and Environmental Factors Involved in Scholastic Success," *University of Iowa Studies of Character* (1927), Vol. 1, No. 2.

expectancy would also vary, so that if 90 per cent of responses were for liking there would be a greater chance than 33⅓ per cent of the second responses agreeing with the first responses.[8a] Rock, accordingly, calculated the chance expectancy of each individual and subtracted this from the percentage of identical responses to give the "percentage of identical response in excess of chance expectancy," given in Table 170. These latter measures of constancy correlate with the uncorrected measures between .75 and .85 for the various subgroups.

Age a factor, as well as interval of time.—The percentage of identical responses for adult women for a day and for adult men for a year and a half is much higher than for college students tested a month apart. High-school juniors tested again after six years have a smaller percentage of identical responses (52.6) than college seniors tested after five and ten years (60.7 and 58.4, respectively). Dunlap's[9] finding of 54.3 per cent of identical responses for seventh-grade students over a ten months' period is in harmony with our results for high-school boys and further supports the view that constancy is less with young people than older ones.

Freyer, summarizing the literature, estimates that stability among high-school and college students is about 50 to 60 per cent for the period of one year.[10] Our data for college students indicate 65 per cent as an average figure, with a higher percentage for adults, and a lower figure for high-school students.

Percentage of identical response is not an entirely satisfactory measure of stability, for it does not take into account whether the changes which occur are large or small. The last two columns of Table 170 record the percentage of changes of one and two categories, the former consisting of shifts from like to indifference and the reverse and from indifference to dislike and the reverse, the latter consisting of shifts from like to dislike and the reverse. A more detailed analysis of the changes for four groups is given in Table 171, where the percentage of identical responses and of

[8a] See footnote 16, p. 664.

[9] J. W. Dunlap, "Relationships between Constancy of Expressed Preferences and Certain Other Factors," *Journal of Educational Psychology* (1936), 27, 521–26.

[10] D. Freyer, *The Measurement of Interests* (Henry Holt & Co., 1931), p. 184.

one- and two-step changes in response for each of the eight parts of the *Vocational Interest Blank* are reported. All these data indicate that there are few two-category shifts and hence most changes are from liking to indifference or the reverse, etc. Approximately 60 per cent of the responses of high-school and college students are identical, 35 per cent are one-category changes, and 5 per cent are two-category changes. The high-school boys have fewer identical responses than college men (53 vs. 61 per cent), a few more one-category shifts, and about twice as many two-category shifts (8.2 vs. 4.5 per cent).

"True" versus *measured permanence.*—The amount of "true" permanence residing in the minds of students is one thing; the amount measured in these studies is something else. The evidence points to the fact that the latter is a poor measure of the former. In other words, there is greater "true" permanence than is indicated by the data given.

As a general indicator of this relationship we may note that most of the changes are "compensating." The averages of the four sets of data in Table 172 indicate that of the 35 per cent of responses that are one-category changes 32 per cent are compensating, i.e., an equal number are from L to I or the reverse, etc., and only 3 per cent represent a net change in the direction of more "like" responses.[11]

The question naturally arises: are these compensating shifts in interest true measures of changes in interest or are they caused by the experimental procedure? If a person's true reaction to an item is halfway between like and indifference, but he is forced to choose between one of these two categories, then it is easy to imagine that on one occasion he may check "like" and on the second occasion "indifference," thereby giving us a one-category shift without there being actually any real change in interest. Employment of only three categories may be responsible for much of the change.

To throw light on the situation, 37 college students were asked to check the first fifteen items from each part of the *Vocational Interest Blank* except Part VI, recording their responses under five

[11] This trend away from disliking to liking is a characteristic of young men, as has already been pointed out in chapter 13.

TABLE 171

CHANGES IN RESPONSE OF 25 COLLEGE FRESHMEN, RETESTED A YEAR LATER, BY PARTS OF THE BLANK

Part	N	Percentage of Identical Responses				Percentage of One-Step Changes					Percentage of Two-Step Changes		
		L–L	I–I	D–D	Total	L–I	I–D	D–I	I–L	Total	L–D	D–L	Total
I—Occupations	100	15.8	20.2	27.1	63.1	4.9	7.8	13.1	8.8	34.6	.7	1.5	2.2
II—Amusements	54	29.3	26.7	10.2	66.2	9.0	5.2	8.1	10.2	32.4	.6	.9	1.5
III—School subjects	39	27.8	25.7	14.6	68.1	6.5	6.1	7.5	10.5	30.5	.4	1.0	1.4
IV—Activities	52	25.9	25.0	14.3	65.2	8.2	6.8	7.5	10.4	32.9	.6	1.3	1.9
V—Peculiarities of people	53	16.6	31.3	18.4	66.3	4.9	8.2	12.3	6.3	31.6	1.0	1.1	2.1
VI—Order of preference	40	21.3	24.6	19.5	65.4	6.5	8.4	9.1	7.6	31.6	2.1	.9	3.0
VII—Comparison of interest	42	29.7	19.0	19.0	67.6	7.6	5.9	5.5	6.8	25.8	2.9	3.7	6.6
VIII—Present abilities	40	28.9	26.2	11.0	66.1	9.1	5.0	5.9	9.9	29.9	2.0	2.0	4.0
Total	420	23.2	24.4	18.0	65.6	6.8	6.8	9.3	8.8	31.7	1.2	1.5	2.7

categories of "like very much," "like," "indifference," "dislike," and "dislike very much." Three weeks later they repeated this.[12] The data as given in Table 173 show 57.2 per cent identical responses, 33.5 per cent of one-step shifts, and 9.3 per cent of two- to four-step shifts. The 57.2 per cent identical responses in this case compare favorably with the 67 per cent reported by Rock

TABLE 172

PERCENTAGE OF CHANGES IN RESPONSE TO 420 ITEMS FOR INTERVALS OF TIME OF ONE TO TEN YEARS

(N = 25 in each group)

Change	1 Year, College Freshmen,[a] Ages 18.6-19.6	6 Years, High-School Juniors, Ages 16.0-21.9	5 Years, College Seniors, Ages 22 4-27.4	10 Years, College Seniors, Ages 22.4-32.4
Identical responses				
Like—Like	23.2	17.9	22.7	21.8
Indifference—Indifference	24.4	18.6	18.3	18.5
Dislike—Dislike	18.0	16.1	19.6	18.1
Total	65.6	52.6	60.7	58.4
One-category shift				
Like—Indifference	6.8	8.4	7.9	8.1
Indifference—Like	6.8	10.8	8.0	8.6
Indifference—Dislike	9.3	8.6	7.9	7.6
Dislike—Indifference	8.8	11.4	9.6	11.4
Total	31.7	39.2	33.5	35.7
Two-category shifts				
Like—Dislike	1.2	3.1	2.5	2.4
Dislike—Like	1.5	5.2	3.3	3.5
Total	2.7	8.2	5.8	5.9

[a] Same data as in Table 171.

for one month on the regular blank (Table 170). A two-step shift in this experiment represents a shift from "liked very much" to "indifference," or the reverse, which seemingly is a greater shift than from "liking" to "indifference," or the reverse. Nevertheless, there are only 9.3 per cent shifts of two or more steps in the

[12] These data were secured for the writer by Professor P. F. Farnsworth from his class in experimental psychology.

experiment, in contrast to 33.4 per cent on the regular blank for high-school and college students in the interval of a month. The obvious conclusion is that most of these 33.4 per cent shifts would have been only one-step shifts on a five-category blank if such a blank had been used instead of the present three-category blank. Evidently, real changes in interest over a three-week period are relatively rare in contrast to "changes" occasioned by the experimental procedure which forces responses into only three categories. Rock sensed this situation when he commented that "over such a short interval the differences can hardly be attributed to a real change of interest due to an increase in age."

TABLE 173

PERCENTAGE OF CHANGES IN RESPONSE TO ITEMS AFTER THREE-WEEK INTERVAL WHEN FIVE RESPONSES ARE POSSIBLE INSTEAD OF ONLY THREE RESPONSES

(N = 37)

Items[a]	No Change	Change of 1 Step	Change of 2 Steps	Change of 3 Steps	Change of 4 Steps
Occupations	55.1	37.5	5.5	1.4	.4
School subjects	59.5	35.0	5.1	.2	.2
Amusements	65.7	29.0	4.7	.4	.2
Activities	58.7	33.0	7.0	1.4	.0
People	56.3	33.0	8.9	1.4	.4
Comparison of interests	56.0	26.9	10.8	3.4	2.9
Present abilities	50.0	39.4	8.8	.8	.9
Average	57.2	33.5	7.3	1.3	.7

[a] Each group of items is composed of the first fifteen items under that heading on the *Vocational Interest Blank.*

The conclusion must be that interests are much more stable than our data indicate, for much of the change that is shown in all our tables is the result of forcing responses to items into one of three categories, whereas, if more categories were employed, nearly all the shifts would be of lesser extent than reported here.[18]

[18] In passing it may be mentioned that Rock reports low positive correlations, "mostly below .20," between "constancy of response, both corrected and uncorrected" and such "factors as age, achievement, and intelligence." Dunlap reports a correlation of about .22 between constancy and intelligence and about .32 between constancy of items in a given field and achievement in the same subject-matter field.

STABILITY OF ITEMS

From this discussion of the constancy of response of individuals to all the items on the *Vocational Interest Blank* we now turn to a brief consideration of the stability or constancy of items as checked by a number of persons.

Stability of each item is not reported for lack of space. Both Burnham and Rock have data on the subject; the former's data are included in his thesis. He reports mean coefficients of stability[14] of items upon college students of 72 ± 4.8 over one week and 62 ± 5.7 over three years. In 413 among 420 items the coefficient for the one-week group was greater than for the three-year group. In every case the stability exceeded chance (coefficient of 43)—there being only three coefficients below 50, i.e., 44, 48, and 49.[15] Using Burnham's coefficient of stability we obtain the mean coefficient of 67 for one hundred occupational items for an interval of a year (in place of 40 shifts reported in Table 174). Our 67 for a year fits in very well with the 72 reported by him for one week and 62 for three years.

It is unfortunate that so many different methods have been used in considering this subject; it increases the difficulty of comparing different sets of data. This is peculiarly the case with the number-of-shifts method, where three different procedures have been used, the last two being substituted for the first because of the labor involved in using the first procedure.

Three procedures for calculating number of shifts.—The first of these procedures records the number of shifts for each person, between test and retest, and the average number of shifts for all persons, for each item. The second procedure disregards compensating shifts between individuals and records the trend—the extent to which shifts have been made from liking toward indifference and disliking, or the reverse, for each item; averages for all items can be easily obtained if desired. The third procedure records average number of likes, indifferences, and dislikes for all items on (*a*) the test, (*b*) the retest, and (*c*) the shift between (*a*) and (*b*). Only the first procedure gives a true picture of the stability of interests. The first procedure may be illustrated as

[14] See p. 654.

[15] P. S. Burnham (1935), *op. cit.*, pp. 52 f.

follows: Suppose the following responses of six men to the first three items on the blank upon two different occasions.

Occupation	Original Responses of Six Men						Retest Responses of Six Men						No. of Shifts per Item Calculated from Each Pair of Test-Retest Records						Total	Average
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6		
Actor	L	I	D	D	L	D	I	L	L	D	D	D	1	1	2	0	2	0	6	1.0
Advertiser .	I	I	I	I	I	L	D	I	I	L	I	D	1	0	0	1	0	2	4	.7
Architect ..	I	D	I	D	I	D	I	L	L	D	I	D	0	2	1	0	0	0	3	.5
Total																			13	2.2
Average for the three items.....																			4.3	.72

The last column gives a measure of the stability of the three items; the smaller the number of shifts, the greater the stability. (The table can be reconstructed so as to show the number of shifts of each individual on all items instead of, as here, the number of shifts on each item for all individuals.) The minimum number possible per individual is 0, the maximum is 2, and the number of shifts which will occur by chance approximates .89.[16]

In the second procedure the responses in the test and retest are used, as given in the first two sections of data above, and then totals of all L, I, and D responses for test and retest are recorded as follows:

Occupation	Total of Responses of 6 Men						Number of Shifts between Test and Retest
	Test			Retest			
	L	I	D	L	I	D	
Actor.....	2	1	3	2	1	3	0
Advertising man.....	1	5	0	1	3	2	2
Architect.....	0	3	3	2	2	2	3
Average per item.....							1.7
Average per item per individual.....							.28

[16] When the test responses are all L (or D), the retest responses by chance should be evenly divided among L, I, and D. This gives an L–L, an L–I, and an L–D combination for each three cases and 0, 1, and 2 shifts, respectively, averaging 1 shift per case. When the test responses are all I, the retest by chance gives 2 shifts per 3 cases or .67 shift per case. As distributions approximate 33.3 L, 33.3 I, and 33.3 D (see Table 14, p. 96, for example), the number of shifts per case by chance is .89. The range is accordingly .67 to 1.00, with the average of our data approximating .89.

In this case a shift, for example, from L to I of one person is canceled by a shift from I to L of a second person and the summary is zero: consequently the second procedure records the trend in the responses, not the total number of shifts.

In the third procedure a tally is made of all L, I, and D responses to all items in the test and retest and these tallies for all items are added and a total obtained. Thus,

	Test			Retest			Number of Shifts between Test and Retest
	L	I	D	L	I	D	
Total for 3 items	3	9	6	5	6	7	3
Average per item							1
Average per item per individual							.17

The amount of .17 represents the total change caused by a shift of .11 from I to L and a shift of .06 from I to D.

Table 174 presents such data on all three procedures for college freshmen tested again when sophomores. The total shifts by

TABLE 174

STABILITY OF INTERESTS OF COLLEGE FRESHMEN FOR ONE YEAR*

(N = 25)

Part	Type of Item	Average Number of Shifts per Item, per Individual			
		First Procedure	Second Procedure	Third Procedure	3½-Year Interval[a] Second Procedure
I*a*	Occupations	.40	.15	.09	.20
I*b*	Occupations	.38	.16	.12	.20
II	Amusements	.36	.15	.05	.14
III	School subjects	.33	.14	.06	.13
IV	Activities	.37	.13	.03	.15
V	Peculiarities of people	.36	.14	.05	.09
VI	Order of preference of activities	.38	.12	...[b]	.13
VII	Comparison of two items	.39	.15	.00	.12
VIII	Present abilities	.38	.13	.02	.14
	Total	.37	.14	.06[c]	.15

* See Table 172 for another method of handling the same data

[a] Based on blanks of 100 engineering students; see C S Glass, *op. cit.*, Table XXVII.

[b] The instructions force a distribution of 30 per cent like, 40 per cent indifference, and 30 per cent dislike on both occasions

[c] The 25 freshmen averaged 31.3 per cent like, 39.9 indifference, and 28.8 dislike. A year later they averaged, respectively, 33.9, 40.5, and 25.6. Sixty-five per cent of responses were identical, 32 per cent were one-category changes, and 2.7 per cent two-category changes.

the first procedure amount to .37 per item per individual. This figure may be compared with that of .89, which represents what chance would give.

When the second procedure is employed, the decimal of .14 is obtained, which represents the amount of net change, or trend, in interests per item after compensating back-and-forth changes have been canceled out. Glass investigated the relationship between the first and second procedures and found the latter gave 40 per cent of the shifts obtained by the former. This agrees with the data in Table 174, since .14 is 38 per cent of .37.

The decimal .14 can be compared with data based upon four groups of men from *Change of Interests with Age*,[17] as follows:

Number of shifts (2d method) between 25- and 35-year-old men.....	.077
Number of shifts (2d method) between 35- and 45-year-old men.....	.056
Number of shifts (2d method) between 45- and 55-year-old men.....	.069
Number of shifts (2d method) between 25- and 55-year-old men.....	.145

Evidently there is as great instability of interests between 18- and 19-year-old college men as between 25- and 55-year-old men.

The third procedure has rather questionable usage when applied to the whole *Vocational Interest Blank*, as it involves the averaging of all manner of items with different interest trends and the averaging of all individuals who filled out the blanks. It does show, however, that the percentages of likes, indifferences, and dislikes change very little from age to age. In Table 175 are given Burnham's data regarding average likes, indifferences, and dislikes for the entire test for the one-week and three-and-one-half-year groups. The changes are very slight. In terms of number of shifts per item per individual there are .035 for one week and .058 for three years. These may be compared with similar data representative of men between 25 and 55 years of age (see Table 176). The change in one week is nearly as great as for the thirty years from 25 to 55 years. The change in three years among college men is half again greater than that for these thirty years.

Stability of different kinds of items.—Analysis of the eight parts of the blank by Rock shows "that no one part was outstandingly good by either criterion [percentage of agreement and percentage of agreement in excess of chance] but that Part VI, Order

[17] *Op. cit.*, Table 58.

of Preference of Activities, was distinctly the poorest group of items, judged by both criteria" (see first two columns of data in Table 177).

The correlation between "identical responses" and "mean percentage of agreement in excess of chance" for the 420 items is only .30. "This is much lower than the analogous correlation for

TABLE 175

LIKE, INDIFFERENT, AND DISLIKE RESPONSES BY FRESHMEN ONE WEEK APART AND BY FRESHMEN TESTED THREE YEARS LATER WHEN SENIORS*

(After Burnham and Glass)

Response	One Week Group		Three-Year Group		Three-and-One-Half-Years Group	
	First Test	Retest	First Test	Retest	First Test	Retest
Like	33.4	33.9	34.6	37.0	33.0	36.1
Indifferent	36.7	39.2	35.0	36.0	39.8	40.2
Dislike	29.9	26.9	30.4	27.0	27.2	23.7
	100.0	100.0	100.0	100.0	100.0	100.0
Number of shifts per item, per individual (3d method)	.035		.058		.066	

* Based on 380 items on the old *Vocational Interest Blank*. Part VI of 40 items is omitted, since the instructions require a distribution of 30–40–30 in the three categories.

TABLE 176

LIKE, INDIFFERENT, AND DISLIKE RESPONSES BY ADULT MEN AT AGES 25, 35, 45, AND 55 YEARS OF AGE*

Response	25-Year-Old Group	35-Year-Old Group	45-Year-Old Group	55-Year-Old Group	55–25 Year-Old Group
Like	35.6	35.7	35.8	34.6	—1.0
Indifference	34.8	33.8	33.3	34.0	—0.8
Dislike	29.6	30.5	30.9	31.4	1.8

Number of shifts per item per individual between 25 and 35 years.... .010
Number of shifts per item per individual between 35 and 45 years.... .005
Number of shifts per item per individual between 45 and 55 years.... .017
Number of shifts per item per individual between 25 and 55 years.... .038

* *Change of Interests with Age*, Table 58, p. 198. Data from Part VI omitted as in Table 175 above.

individuals, which was approximately .80, indicating that chance is a much more important factor in the item analysis than in the individual analysis."

TABLE 177

STABILITY OF ITEMS, IN TERMS OF PERCENTAGE OF IDENTICAL RESPONSES

(After R. T. Rock, Jr.) (N = 437)

Part	No. of Items	Types of Items	Mean Percentage of Agreement	Mean Percentage of Agreement in Excess of Chance	Quartile in Percentage Agreement		Quartile in Percentage Agreement in Excess of Chance	
					Upper	Lower	Upper	Lower
Ia	50	Occupations	65.7	28.0	24	42	47	22
Ib	50	Occupations	66.4	28.9				
II	54	Amusements	71.2	28.3	23	5	18	5
III	39	School subjects	69.8	32.9	13	1	25	1
IV	52	Activities	66.6	30.0				
V	53	Peculiarities of people	70.3	24.2	30	3	2	21
VI	40	Order of preference of activities	58.9	20.0				
VII	42	Comparison of two items.	64.6	23.3				
VIII	40	Present abilities	64.2	22.4	6	18	3	25
Total	420		66.7	26.6				
		Social conditions			3	16	10	6
		Working conditions			3	20	0	24
		Miscellaneous			3	0	0	1
		Total			105	105	105	105
		Average number of words per item			3.1	5.6	2.2	5.8

Rock classified the items under 8 groupings as shown by the "types of items" opposite the data given in the right-hand half of Table 177. In this classification, "for example, under occupations certain activities and types of work were included as well as the mere names of occupations." The items were then subdivided into four quartiles on the basis of score, the upper and lower quartiles being reported in the table. He reports:

According to the per cent agreement analysis it will be seen that 23 of the upper quartile items were in the Amusement category while only 5 of the lower quartile items fell in this group. Looking down these two col-

umns it appears that Amusements, School Subjects and Peculiarities of People account for 66 of the 105 good items as against 9 of the poor items. Considering the lower quartile grouping, it appears that the four categories of Occupations, Self-Ratings, Social Adjustments and Working Conditions account for 97 of the 105 poor items as against 36 of the good items in these categories.

Using per cent agreement in excess of chance as the criterion of selection of items it appears that Amusements and School Subjects again contribute heavy proportions of good items and that Self-Ratings and Working Conditions consist chiefly of poor items.

Occupations and Characteristics of People show marked reversals on the two criteria indicating the importance of considering the corrected as well as the uncorrected agreement values. The apparent superiority on the first criterion of the category, Characteristics of People, is due in large part to the practical unanimity of attitudes toward such items as "men who use perfume."

Burnham found school subjects and amusements the most stable, and order of preference of activities (Part VI) and comparison of items (Part VII) the least stable. The first two averaged 70 coefficient of stability for his two groups of subjects; the last two 64.

Whether we average the measures of stability or the rank orders reported by Rock, Burnham, Glass, Seder, and the writer, we obtain the following rank order for stability of parts of the blank, namely, Part III—School Subjects, II—Amusements, V—People, IV—Activities, I—Occupations, VII—Comparisons of Items, VIII—Present Abilities, and VI—Preference of Activities. There is, however, very little difference in the relative standing of the eight parts. Possibly the first two are superior and the last one inferior to the remainder.[18] If instead of considering percentage of agreement we use percentage of change from like to dislike and the reverse a slightly different order of merit is obtained in which Parts VII, "Comparison of Items," and VI, Order of preference, interchange their rank order (see Table 172). There is evidently considerable variation among the findings of different investigators, with no way of determining how much these variations reflect the different groups of individuals tested, the different methods of

[18] In terms of average number of changes, the parts rank as follows: Abilities, School subjects, Amusements, People, Order of preference, Comparison of items, Activities, and Occupations.

measuring stability which were used, and the different ways in which interest items are presented.

It is probably significant that the three parts of the blank which have the highest stability are composed of the more familiar items and are expressed by relatively few words while the three parts which have the lowest stability are composed of items expressed by many words. Rock has reported that "the items having the lowest constancy values tended to be long and wordy while those having the highest constancy values were almost all items of one or two words." It is quite possible that when items of many words are used the emphasis is placed upon one word in an item on the first occasion and upon another word on the second occasion thus causing different responses to the same item because of two different interpretations of it.

Part VII of the blank—Comparison of Interest between Two Items—was prepared by the writer in order to restrict the area to which the interest response is to be made. For example, managers of streetcar lines state that practically all applicants for jobs express a definite preference for being a motorman or a conductor. These two occupations would accordingly appear to be good diagnostic items. When used singly far too many men indicate indifference or dislike presumably reacting to the low social standing of the jobs rather than to the actual work performed. By combining them into one item it was believed attention could be forced upon their intrinsic characteristics and elements common to both would be ignored. The writer's opinion is that the objective can have been accomplished only in part for far too many respond with "indifference." This point has been brought up because the development of items involving comparison of two elements necessarily means "wordy" items which according to the results of Rock are less stable. What is the happy mean in terms of stability between number of words and specificness of meaning?

Like responses are more stable than indifferent or dislike responses, according to Rock—the mean constancy values for the three are 74.3, 65.4, and 61.7, respectively. This relationship holds true, on the average, for all the parts of the blank, except Part V—Peculiarities of People, where indifferent responses are the most stable.

Analysis of individual items as to their stability and usefulness in differentiating occupations is too long and involved to be considered here.

Relation of stability to occupational-interest score.—Lack of stability in many items does not vitiate ocupational scores to anything like the degree that a superficial examination of the situation would indicate. Since we have found it well nigh impossible to present in an easily comprehended manner the statistics based on a number of blanks, we use here the data from only one blank to illustrate the effect of changes in response upon occupational-interest scores. This blank is No. 1 of our college freshmen group, which, it was discovered later, gives data agreeing very closely with the average of the first ten blanks in the group. The first column of Table 178 indicates that there are 265 identical responses between the two tests a year apart, 125 shifts of one step, and 10 shifts of two steps, i.e., from liking to disliking or the reverse. (The averages for ten blanks are 262.8, 124.7, and 12.1, respectively.) The second column of the table gives the raw scores of the first test on the engineer scale for the 400 items according to their classification in column one; the third column gives the data of the retest; and the fourth column gives the difference in score between test and retest. Corresponding data on the life insurance and accountant scales are also shown in the table. (The three scales used here are the scale on which No. 1 scores highest [engineer], the scale which correlates lowest with engineer [life insurance], and the scale which correlates approximately zero with engineer [accountant]. Rather extensive data show that changes based on three such scales are somewhat higher than changes based on all occupational scales. Shifts in responses cause, then, somewhat smaller changes in occupational score, on the average, than those indicated in the table.) Using the data as they stand, however, we can conclude, first, that a high percentage of the total occupational score is determined by the items to which there are identical responses in the two tests; and, second, that shifts in response do affect the final score somewhat.

The reason why shifts in response to as many as 125 items among 400 do not affect the final score to any great extent is that some of the shifts increase the occupational score, some decrease

the score, and the remainder do not change the score; so that the net result is only a slight increase or decrease in total score. This phenomenon is further proof that the true response in about one-third of the cases is about halfway between L and I, or between I and D, and that on each occasion such items are marked L or I (or I or D) pretty largely by chance; with the result that these items constitute a large proportion of the shifts in response and at the same time account for a very small net change in total occupational score.

TABLE 178

HOW CHANGES IN RESPONSE BETWEEN TEST AND RETEST AFFECT THREE OCCUPATIONAL-INTEREST SCORES

	Number of Responses	Total of Raw Scores Opposite Each Category								
		Using Engineer Scale			Using Life Insurance Scale			Using Accountant Scale		
	'30–'31	'30	'31	Difference	'30	'31	Difference	'30	'31	Difference
L—L	77	54	54		—8	—8		13	13	
I —I	94	5	5		—28	—28		1	1	
D—D	94	59	59		—40	—40		—33	—33	
Total	265	118	118		—76	—76		—19	—19	
L—I	30	2	0	—2	5	—5	—10	—2	4	6
I—L	20	—4	9	13	—5	—7	—2	3	2	—1
I—D	28	—3	13	16	—8	—3	5	3	0	—3
D—I	47	—3	3	6	16	—14	—30	—17	—9	8
Total	125	—8	25	33	8	—29	—37	—13	—3	10
L—D	8	2	—2	—4	0	1	1	2	—1	—3
D—L	2	—2	0	2	2	0	—2	—2	1	3
Total	10	0	—2	—2	2	1	—1	0	0	0
Raw Score ...		110	141	31	—66	—104	—38	—32	—22	10
Standard Score		50	57	7	20	12	—8	17	20	3
Data for Ten Blanks[a]: Standard Score ...		53.3	53.4	.1	16.5	13.4	—3.2	24.7	24.0	—.7

[a] The three scales were in each case the scale on which the man scored the highest, the scale which correlated lowest with the first scale, and the scale which correlated nearest zero with the first scale.

Chapter 26. Minor Studies

Results of several short studies are reported in this chapter. They consist of (1) Interests of different racial or national groups, comparing Scotchmen vs. Americans, second-generation Japanese vs. whites, and Negroes vs. whites; (2) Influence of heredity, as shown in the interests of twins and the interests of fathers and sons; (3) Faking occupational scores, both when guidance is desired and when the test is used for selection; and (4) the effects of rigid assignment of men to the occupations on which they score highest.

INTERESTS OF DIFFERENT RACIAL OR NATIONAL GROUPS

The *Vocational Interest Blank* has been standardized upon men living in the United States. Can it be used effectively upon men living elsewhere? Obviously men who do not understand the English language are debarred.[1] It is not so clear, however, that men using the English language but brought up in England, India, or Australia, where some words carry meanings different from those in the United States, can use the test profitably. Not only is it necessary that the "apperceptive mass" of words shall be approximately equivalent but also that occupations shall be similar. For example, if typists in two countries did nothing but type they would be equivalent, but if in one country typists spent some time receiving callers and in the other country some time performing simple bookkeeping, the two occupations would not be equivalent. Consequently, when data upon English-speaking people working elsewhere than in the United States are found to differ somewhat from standards set up here, it is not clear whether the trouble lies in the fact that the items have been misunderstood from our point

[1] No psychologist would want to use a mere translation of such a test without standardizing it upon new records.

of view or that the men have been improperly classified, occupationally speaking, according to our usage.

Correspondence with men using the test upon English-speaking peoples in Canada, the Philippine Islands, Australia, and New Zealand, and upon Chinese students well advanced in the study of English indicate that satisfactory results are being obtained. Vernon,[2] on the other hand, states: "Needless to say his [Strong's] test cannot be legitimately employed in this country, since it is far from likely that the likes and dislikes of Californian and British vocational groups will be sufficiently similar." Another English authority claims that, even if data show similarity of interests of Scottish men from Dundee and Americans, this does not prove that American norms would apply to the south of England. The only data that have been so far accumulated which will really throw light upon this situation are those reported here by Dr. Helen Pallister and her husband, Professor W. O'D. Pierce, formerly of St. Andrews University, Scotland.

Scottish and United States men compared.[3]—*Vocational Interest Blanks* were filled out by artists, journalists, ministers, and policemen living in Dundee, Scotland, or its vicinity. The first two groups are employed by the same firm and are closely associated together in the production of illustrative and advertising material for the same group of journals, mainly of the pulp-magazine variety, and for two daily newspapers. The journalist group subdivides as follows: (1) editorial writers on boys' and girls' pulp magazines, (2) writers on sporting topics for week-end newspapers, and (3) journalists on evening and daily newspapers. The ministers constitute 61 per cent of the Church of Scotland and the policemen one quarter of the policemen in the Dundee area.

Mean scores and percentage of letter ratings for each of the four groups are given in Table 179, together with the corresponding data from our criterion groups. According to the data Scottish artists and policemen score pretty much as Americans (critical ratios of only 1.8 and 2.0, respectively), while ministers and

[2] P. E. Vernon, "The Assessment of Psychological Qualities by Verbal Methods—A Survey of Attitude Tests, Rating Scales, and Personality Questionnaires," *Medical Research Council, Industrial Health Research Board* (1938), No. 83, pp. 99–100.

[3] Unpublished study by H. Pallister and W. O'D. Pierce (1938).

particularly journalists differ significantly from our data. Before accepting these figures at face value it must be recognized that when norms are based upon the same 250 blanks which were used in the development of the scale the norms will be about 1.5 standard scores higher than if new blanks were used in establishing the norms. Consequently differences between the Scottish and United States groups are greater by 1.5 standard scores than they presumably should be.[4] If this correction is taken into account, the critical ratios of the differences of means of the two groups are decreased so that only in the case of journalists is the difference statistically significant (4.1), with the differences of ministers almost equaling the standard of statistical significance (2.7), while the differences with policemen and artists are negligible (1.0 and 0.8, respectively).

TABLE 179

COMPARATIVE DATA ON OCCUPATIONAL-INTEREST SCORES OF SCOTTISH AND AMERICAN GROUPS

(After Pallister and Pierce)

	Artist		Journalist		Minister		Policeman	
	Scot	U.S.	Scot	U.S.	Scot	U.S.	Scot	U.S.
N.....	56	231	58	249	49	250	66	254
Mean....	47.4	50.0	43.2	50.0	43.8	50.0	47.2	50.0
Sigma...	9.3	10.0	8.5	10.0	11.1	10.0	9.0	10.0
C.R.	1.8		5.3		3.6		2.0	
Corrected C.R.[a]...	0.8		4.1		2.7		1.0	
Ratings .								
A.....	64.3	72.3	44.8	69.9	53.0	71.2	63.6	71.3
B+....	14 3	10.8	20.7	12.0	8.2	12.0	19.7	13.4
B.....	12.4	7.8	13.8	7.6	14.3	6.8	7.6	6.3
B—....	3.6	4.8	15.5	6.0	12.2	5.6	4.6	5.1
C+....	3.6	2.2	5.2	4.0	10.2	2.8	3.0	3.1
C.....	1.8	2.2	0.0	0.0	2.0	1.6	1.5	0.8

[a] See text for explanation of correction

Table 180 gives the mean scores of the four Scottish groups and corresponding American groups on four occupational scales. Here again we have close agreement between the two national

[4] See p. 649.

groups of artists and policemen but substantial differences with journalists and ministers. It is true that Scottish artists score 4.2 higher on the policeman scale than Americans and Scottish policemen score 4.7 higher on the minister scale than Americans; but both Scottish groups differ very little from the corresponding American groups on the other three scales.

TABLE 180

OCCUPATIONAL-INTEREST SCORES OF AMERICAN AND SCOTTISH ARTISTS, JOURNALISTS, MINISTERS, AND POLICEMEN

Occupation	N	Artist Scale		Journalist Scale		Minister Scale		Policeman Scale	
		Mean	Sigma	Mean	Sigma	Mean	Sigma	Mean	Sigma
		AMERICANS							
Artist	100	50.0	10.0	45.8	8.2	24.8	12.8	20.4	9.8
Journalist .	100	41.7	12.8	50.0	10.0	22.6	11.1	16.8	8.6
Minister ...	100	25.9	10.4	33.3	8.8	50.0	10.0	26.9	8.0
Policeman .	100	18.5	10.2	26.5	8.2	19.5	11.0	50.0	10.0
		SCOTCHMEN							
Artist	56	47.4	9.3	45.7	8.2	22.5	13.0	24.6	9.4
Journalist .	58	36.3	10.8	43.2	8.5	23.5	12.4	28.2	10.5
Minister ...	49	32.4	10.4	39.2	8.4	43.8	11.1	26.2	7.7
Policeman .	66	21.4	9.7	27.7	7.9	24.2	11.3	47.2	9.0

Since two Scottish occupations, widely differing in character as are artists and policemen, score practically as do Americans, it would appear that differences in language usage between Scotchmen and Americans do not affect these scores on the *Vocational Interest Blank* appreciably. The greater differences in scores in the case of Scottish journalists and ministers from American norms can best be attributed at this time to differences in sampling. In the case of the journalists we suspect that our authors and journalists represent men of greater reputation than the Scottish sample. Our criterion group is composed of men of standing sufficient to be included in *Who's Who* and other lists of this sort representing the country as a whole, whereas the Scottish sample includes all those considered to be successful in only one publishing house. In the case of the ministers the contrast is between Scottish

clergymen who are Presbyterians and 250 American clergymen only 112 of whom are Presbyterians. Whether or not the interests of Presbyterian ministers differ from the interests of Congregational, Methodist, Baptist, and Episcopalian ministers is unknown.

Second-generation Japanese and whites. — Japanese high-school boys, born in this country, have interests similar in most occupations to those of white boys (see Table 181). This simi-

TABLE 181

PERCENTAGE OF JAPANESE AND WHITE HIGH-SCHOOL BOYS WHO OBTAIN RATINGS OF A AND B+ FOR INTEREST IN 19 OCCUPATIONS*

Occupational Interests	A and B+ Ratings			
	Japanese	Whites	Differences	Critical Ratio
Farmer	39.4	32.2	7.2	3.1
Physician	29.5	23.6	5.9	2.7
Teacher	10.5	5.6	4.9	3.6
Architect	4.1	3.4	0.7	0.7
Chemist	13.2	12.5	0.7	0.4
Engineer	32.4	29.9	2.5	1.1
Minister	2.5	2.1	0.4	0.5
C.P.A.	0.5	0.6	—0.1	—0.3
Artist	0	0.2	—0.2	—1.4
Advertising man	0	1.2	—1.2	—3.6
Psychologist	0.4	1.4	—1.0	—2.3
Y.M.C.A. secretary	4.1	4.0	0.1	0.1
Life insurance salesman	1.2	4.1	—2.9	—3.9
Vacuum cleaner salesman	11.8	9.8	2.0	1.3
Personnel director	3.9	5.5	—1.6	—1.6
Journalist	21.4	24.2	—2.8	—1.4
Realtor	3.7	12.0	—8.3	—6.8
Lawyer	9.3	15.3	—6.0	—3.8
Purchasing agent	22.0	34.5	—12.5	—5.8
Average	11.1	11.7	—.6	...

* Based on data from 676 Japanese born in the United States and 1,086 whites.

larity is expressed in Table 182 by coefficients of correlation ranging between .63 and .95, depending upon the educational status of the two groups and upon the method of measuring the

[5] E. K. Strong, Jr., and R. Bell, *Vocational Aptitudes of Second-Generation Japanese in the United States*, Stanford University Publications, Education-Psychology, 1933, Vol. I, No. 1, chapter v; and E. K. Strong, Jr., *The Second-Generation Japanese Problem* (Stanford University Press, 1934), pp. 171–75.

similarity. The sampling of high-school boys of both races was excellent, but that of college men was not so good. Records of only 107 Japanese college men in continental United States could be obtained, as few second-generation Japanese were old enough at that time (1930–31) to attend college. It was impossible to determine what sort of a sampling of second-generation males they represented, and consequently no attempt was made to obtain a comparable sampling of whites; available records of 860 white college men were used. Certain differences in vocational interests

TABLE 182

AGREEMENT BETWEEN OCCUPATIONAL INTERESTS OF JAPANESE BORN IN THE UNITED STATES AND WHITES*

Measures	High-School Boys[a]	College Men	11th Grade Only
Mean scores	.95	.87	.91
Percentage of A ratings	.94	.63	.84
Percentage of A and B+ ratings	.93	.77	.89
Percentage of A, B+, B, and B− ratings	.94	.83	.91

* Expressed in terms of rank-order correlations between 19 occupational mean scores or ratings

[a] Equivalence of sampling of the two groups is best for the "11th grade only," next best for "high-school boys," and poorest for "college men."

between Japanese and whites appear, however, to be fairly significant. When the differences, expressed by critical ratios, are averaged, it appears that the Japanese score higher than the whites in the following occupations:

Occupation	Critical Ratios Highest	Lowest	Average Critical Ratio[a]
Teacher	4.3	2.0	3.2
Farmer	3.1	2.2	2.6
Physician	3.8	0.7	2.2
Minister	5.4	0.5	2.1
Chemist	4.0	0.4	1.9
Architect	4.2	−0.5[b]	1.6
Y.M.C.A. secretary	3.7	−0.8	1.5
Engineer	2.3	0.5	1.2
Vacuum cleaner salesman	1.3	−1.5	0.4

[a] Based on the critical ratios in Table 181 and in three other tables which appear in the monograph.

[b] A minus sign before a critical ratio means the whites score higher than the Japanese; otherwise the reverse is the case.

And the whites score higher than the Japanese in the following:

Occupation	Critical Ratios Highest	Lowest	Average Critical Ratio
C.P.A.	0.3	−1.4	−0.3
Psychologist	5.0	−3.4	−0.4
Artist	3.4	−3.4	−0.7
Personnel director	0.7	−2.6	−0.8
Journalist	−1.4	−3.0	−2.3
Purchasing agent	1.4	−5.8	−2.6
Advertising man	−0.8	−5.0	−3.2
Life insurance salesman	−2.4	−3.9	−3.3
Lawyer	−3.6	−5.5	−4.2
Real estate salesman	−3.9	−7.5	−5.9

In terms of occupational groups, the Japanese tend more than whites to have the interests of Groups I, II, IV (as far as farmer is concerned), and V, i.e., scientific, mechanical, and "uplift" interests; whereas the reverse holds with respect to the interests of Groups VII, VIII, IX, and X, i.e., office, sales, advertising, writing, and law. Three exceptions to the foregoing may be noted—whites have slightly stronger interests than Japanese in Artist and Psychologist of Group I and in Personnel manager of Group V. But it must be noted that there are only five average critical ratios among nineteen which are as large as 3.0.

To the writer it seems surprising that the second-generation Japanese should score so nearly like white children when it is realized that many of them speak Japanese in their homes and few of them speak good English. Surely English words cannot have the same wealth of meaning that they have for white children. Possibly this does not have any great effect upon responses to interest items. Possibly herein lies the explanation for the similarity of responses of Scottish and American adult men, since there are different language usages in the two countries. Pierce pointed out that certain items were regularly omitted as unfamiliar to his subjects.

Negroes and whites.—The only available data pertaining to Negroes was furnished by Professor R. Hernandez of Meharry Medical Colllege. Twenty-five Negro women, average age 20.3 years and average education two years beyond high school, were scored on the women's interest scale for nurse at the beginning of their course of training in that field. Their scores ranged from 44

to 63, with an average of 53.5, which is superior to that of our criterion group of white nurses. Ninety-two per cent rated A and 8 per cent B+, whereas only 71 per cent of the criterion group rated A and 13 per cent B+.

INFLUENCE OF HEREDITY

Similarity of abilities of members of a family and especially of twins has been customarily attributed to the influence of heredity. This is not the place to discuss the pros and cons of that subject which seems to become more involved and controversial as research in the field is advanced. A small amount of data is presented dealing with the interests of twins and of fathers and sons.

Carter[6] gave the *Vocational Interest Blank* to 120 pairs of twins, 105 of whom were in high school. Forty-three pairs were monozygotic, 43 pairs were like-sex dizygotic, and 34 pairs were unlike-sex dizygotic. All blanks were scored on 23 of the original scales for men. A correlation of .50 is reported between the interests of monozygotic twins and .28 between dizygotic twins. (Unlike-sex correlated .30 and like-sex .26).

One hundred and ten pairs of fathers and sons were used in the second study.[7] The fathers average 58.1 years of age (range between 35 and 78 years, sigma 7.27) while the sons average 21.9 years of age (range between 15 and 28 years, sigma 2.21). The rather large difference in age of 36 years between the two groups is due in part to two factors. First, in the case of 74 pairs the sons filled out the blank in 1927 and the fathers in 1935 thus increasing the difference in age between the two by eight years. Second, in the case of eight pairs the fathers were outstanding business leaders who under the circumstances were far more likely to ask their youngest son to fill out the blank than an older son no longer at home.

The sons can be further classified as follows: (*a*) 74 graduates of Stanford University in the class of 1927, (*b*) 20 students in the Graduate School of Business at Stanford, (*c*) 8 sons of prominent business executives, and (*d*) 8 miscellaneous cases.

[6] H. D. Carter, "Twin Similarities in Occupational Interests," *Journal of Educational Psychology* (1932), **23**, 641–55.

[7] Two fathers have two sons each and one father has three sons.

The fathers and sons were engaged in, or planning to enter, a wide variety of occupations. The relationship between choice of occupations is as follows: 25 pairs in same occupation, 15 in related occupations, 62 in unrelated occupations, 6 sons "don't know," 1 father retired, occupation not reported, and 1 record of occupation mislaid; total 110 pairs.

Correlations between scores of fathers and sons on 22 scales range between .11 and .48 and average .29. This correlation is statistically significant. As a check, the score of father A was correlated with the score of the son of father B, the score of father B with the score of the son of father C, etc. The average of such correlations is —.03.

According to these data the interests of fathers and sons are associated to the same degree as the interests of dizygotic twins, as reported by Carter.

Similar studies are needed upon other pairs of fathers and sons so that changes in interests because of age may be taken into account. Thus sons averaging 30 or 40 years of age may have interests more in harmony with those of their fathers because both are mature adults, or they may have interests less in harmony because for from ten to twenty years the two have not lived in as close environmental relationship.

The foregoing data based on twins and fathers and sons are lower than corresponding correlations based on abilities. Members of families, consequently, are more similar with respect to scores on ability tests than on interest tests.

Can any conclusion be drawn from these data regarding the influence of heredity and environment? Wilson[8] reports somewhat similar correlations to those of Carter regarding the interests of twins. He points out that identical twins have a more identical environment than is the case with fraternal twins. He mentions, for example, that identical twins more often had children's diseases simultaneously than fraternal twins. But here again we are faced with the problem of interpretation of the data. Is it because identical twins are exposed to disease simultaneously more often than fraternal twins that they come down sick together, or is it

[8] P. T. Wilson, "A Study of Twins with Special Reference to Heredity as a Factor Determining Differences in Environment," *Human Biology* (1934), 6, 324–54.

because being alike in susceptibility to disease they contract the disease together when it is encountered? The answer depends in large degree upon whether one holds that human beings respond to environmental stimuli as they are met or that men and women seek an environment where they can more successfully satisfy their desires. Upon the latter basis we must assume that the more similar the heredity the more the individuals will seek similar environmental conditions.

Amount of difference in interests between the two sexes remains about the same from age 15 to 65 years;[9] if there is any change the amount decreases slightly from age 15 onward. This might be construed as proof of innate differences in interests of males and females. But the two sexes correlate as highly as do 15- and 55-year-old men,[10] a fact which can be used to substantiate the claim that the differences in the two sexes are learned just as the differences between 15- and 55-year-old men are presumably learned.[11] But it is a little puzzling why boys and girls learn different interests by fifteen years of age and unlearn them so very little thereafter.

It is similarly difficult to understand why occupational interests are so little affected by experiences on the job or by training for the job (see chapter 15) unless one can assume that interests reflect inborn abilities. Why are characteristic occupational interests present in many high-school pupils before little or any experience or training for the occupation?

Are interests inherited as are physical traits? The first answer to this question must be "No." Interests are related to objects and activities in the environment in quite a different sense from height or color of eyes. Interests are learned. Liking to be an aviator and disliking gardening are reflections of experience. The second answer to this question is that interests are inherited to some degree. An interest is an expression of one's reaction to his environment. The reaction of liking-disliking is a resultant of satisfactory or unsatisfactory dealing with the object. Different people

[9] See Figure 13, p. 232. [10] See Tables 9 and 10, pp. 91–92.

[11] It can be argued that changes in interest with age are reflections of changes in the bodily structure of man. It is certainly easy to explain decreasing interest in activities involving physical activity and daredeviltry on such a basis. But is this the true explanation?

react differently to the same object. The different reactions, we suspect, arise because the individuals are different to start with. We suspect that people who have the kind of brain that handles mathematics easily will like such activities and vice versa. In other words, interests are related to abilities and abilities it is easy to see can be inherited. There is, however, a pathetic lack of data to substantiate all this.

Two reasons may be advanced as to why there is as yet so little proof that interests and abilities are related. In the first place interests must reflect one's environment. An Indian boy with fine finger co-ordination would probably like to make arrows. An American boy might want to be an electrician, a dentist, or a watch repairman. Here interest is exhibited toward four different activities, but it is based in all four cases upon the same ability. So far there has been no attempt to prove such relationships. In the second place, interests are evaluated by one's environment. Under our existing educational system white-collar jobs are esteemed. Consequently a boy looks for activities in that realm which fit his abilities. If skilled trades were equally esteemed, many a boy would show an interest in such activities. The exceptional boy with outstanding abilities might be expected to seek (be interested in) activities with less regard to society's standards than the great majority and with more concern for his own proclivities; but even he will be influenced greatly thereby. Because of these two factors it is extremely difficult to relate the interests of a boy to the underlying abilities. Until this is done most studies in this field will be based upon certain abilities and certain interests, the abilities and interests having been selected on the basis of the experimenter's guess that they are related. The results will accordingly reflect ascertained relationships and the experimenter's guess.

FAKING OCCUPATIONAL SCORES

The question is frequently raised, Do people tell the truth on a paper-and-pencil test? With aptitude tests this is not ordinarily a problem, since it is usually to the advantage of the testee to get as many correct answers as possible. The problem might appear if testees did not want to pass some selection test, say in the army; the writer had once to deal with a number of first-class stenogra-

phers who did not want that sort of work in the war of 1914–1918 and deliberately failed in typewriting and stenography tests. The problem is much more serious with personality tests, since there is no way of knowing in most cases whether the responses are genuine or not. We are concerned here, however, only with the problem as it pertains to an interest test.

The problem may be considered from three angles. First, how far can scores be changed when one is deliberately trying to do so. Second, how far are scores affected when one takes the test for guidance purposes. Third, how far are scores raised or lowered when one must pass the test in order to be selected for some position.

Deliberate effort to falsify.—Three investigations are reported bearing on the extent to which one can deliberately obtain a high score on a certain scale.

In the fall of 1927, the writer requested his class of 34 engineering seniors and Graduate School of Business students to fill out the *Vocational Interest Blank* in the usual manner. The blanks were scored and the results given to the students and the whole topic discussed in class. About a month later the members were requested to fill out the blank again, and this time to make every effort to secure as high a score as possible in engineering. The twenty-two engineering students raised their raw mean score from 194 (almost an A rating) on the original engineering scale to 336, an increase of 142; the thirteen business-school students raised their mean score from —30 (C rating) to 362, an increase of 392. It is rather surprising that the latter obtained higher scores than the engineers when both were deliberately fudging. Among these thirty-four students there were five who raised their scores only slightly, two who did not change them at all, and two who actually lowered them. The last four, however, were engineering students with A ratings to begin with. For both groups the increase was from 111 to 345, amounting to 234. Roughly, this raw score gain of 234 equals 17.7 standard scores. Fudging can cause a very great change in score.

Steinmetz[12] administered the interest test to 46 volunteers at

[12] H. C. Steinmetz, "Measuring Ability to Fake Occupational Interest," *Journal of Applied Psychology* (1932), **16**, 123–30.

San Mateo Junior College (California) in February 1930 and again about six weeks later. On the second occasion the students were requested to secure as high a score as possible in teaching-administration, as though their livelihood depended on it. Among other things the instructions stated, "I want you to show me how well you know the interests, attitudes, likes, and dislikes of men school teacher-administrators." The first mean teacher raw score was —34 (σ_m of 17.3) and the retest score was 213 (σ_m of 21.0), giving an increase in raw score of 247. Other large differences in score were 288 on Y.M.C.A. secretary, 243 on minister, 192 on personnel manager, and 145 on C.P.A.; also —98 on realtor, —148 on artist, and —168 on farmer. The percentage of A ratings on teacher-administrator increased from 13 to 78 and on farmer decreased from 17 to 0. Deliberate fudging can raise scores very greatly on the desired scale; at the same time there are profound changes in other occupational scores.

Kelly, Miles, and Terman[18] administered the Terman-Miles MF test to college sophomores in the ordinary manner: subsequently the students were instructed to mark the test to give as high a masculine score and on another occasion as high a feminine score as possible. It is reported by Terman and Miles that

> A typical group of males at the most masculine age are able to earn a mean score more feminine by far than the mean of any female group we have tested; a typical female group can make itself appear far more masculine than any male group we have tested! . . . . The shift amounts to seven or eight times the standard deviation of the usual naive score distribution.

Evidently testees can deliberately obtain high occupational-interest scores when they try, and men and women can respond so as to give scores more masculine or more feminine than are found normally.

Faked responses affect not only the simulated occupational interest but distort seriously at least half of the remaining occupational scores. As is to be expected, the tendency is for faking to

[18] E. L. Kelly, C. C. Miles, and L. M. Terman, "Ability to Influence One's Score on a Typical Paper-and-Pencil Test of Personality," *Character and Personality* (1935), 4, 206–15; also L. M. Terman and C. C. Miles, *Sex and Personality* (McGraw-Hill Book Co., 1936), pp. 77–79.

raise the scores on occupations which are positively correlated with the simulated occupation and vice versa. But the correlation is only .50 between increase in score because of faking and the correlation between the occupation in question and the occupation upon which the man desires a high score. With such a correlation some exceptions to the general tendency are to be expected. For example, the interests of psychologists correlate .47 with those of the original teacher scale, yet the mean score on psychologist decreased slightly when students fudged their teacher responses.

An analysis of the shifts in item responses when fudging engineer interest shows no change in 59 per cent of the cases; this is typical of all parts of the *Vocational Interest Blank* except Part V, pertaining to people, where 68 per cent were unchanged. Of the remaining 41 per cent, 34 per cent represented shifts of one category and 7 per cent from liking to disliking or the reverse. Such an amount of shifting in response is comparable to that on the part of seniors retested ten years later (see Table 170, p. 657). The two cases are, however, not as similar as the figures would suggest; for the shifts by seniors over ten years were largely compensating, changing the total scores very little, whereas when students attempt to obtain a high engineering score the shifts are largely in the desired direction.

Further analysis shows that the shifts that produced the largest effect were on items that everyone associates with engineering, items such as chemist, civil engineer, draftsman, etc. Shifts on such items gave an average net increase in raw score of 3.3, composed of 3.7 in the right direction and —.4 in the wrong direction. On the remaining items the average net increase was but 1.1, composed of an increase of 1.5 and a decrease of —.4. Fudging occurs, as would be expected, far more on items that are obviously related to the simulated occupation than on other items.

We have here the best possible answer to the oft-expressed desire to reduce an interest test to only the items which have large weights. Statistically, the larger the weight the better the item; practically, the larger the weight the more likely the testee may guess the proper response.

Faking when guidance is desired.—The large number of correlations over .80 and particularly over .90 reported in this book

are good evidence that there is remarkable consistency in responses to interest items. A small amount of fudging would make such high correlations most unlikely. In fifteen years we have heard of only a very few cases where students have fudged an interest test which they were voluntarily taking. Terman and Miles[14] present evidence that little or no fudging occurs with their MF test. We believe accordingly that when a person *voluntarily* takes an interest test he gives responses which represent his interests.

Spencer[15] presents evidence that fudging takes place respecting certain items on personality tests. Terman,[16] on the other hand, has analyzed responses to his marital happiness test and has found "almost complete lack of halo effects." There are very few items on our *Vocational Interest Blank* to which people are unwilling or reluctant to respond. For example, the item "sick people" annoys some ministers—they confess they don't like such people but they feel they ought to. Some of the items in Part VIII dealing with present abilities and characteristics are of this sort. But falsification on these items would affect total interest scores very little, since there are few such items and the weights are usually small.

Under normal conditions there is little or no apparent temptation to fudge, since the person takes the test in order to discover what his interests are. But there is the possibility of unwitting fudging—the marking of items favorable to one's recognized vocational choices. Evidence was given on page 401 that a person scores slightly higher on an occupation he is planning to enter than on a retest after he has changed his occupational choice. The surprising thing is that scores are so little affected in this way.

Faking when interest test is used for selection.—When a person wants a job and must pass the interest test, there is a motive for getting as high a score as possible on the test. The temptation is to mark some items as one believes they should be marked instead of as one is really interested in them. Interest tests have

[14] L. M. Terman and C. C. Miles, *op. cit.*, pp. 78–79.

[15] D. Spencer, "The Frankness of Subjects on Personality Measures," *Journal of Educational Psychology* (1938) **29**, 26–35.

[16] L. M. Terman, "The Effect of Happiness or Unhappiness on Self-Report Regarding Attitudes, Reaction Patterns, and Facts of Personal History," *Psychological Bulletin* (1939), **36**, 197–202.

only recently been used in this connection and we do not know yet how much fudging may occur. Bills[17] has encountered such cases. She noted that casualty and life-insurance salesmen under 24 years of age who rated A on both the insurance and realtor scales did not succeed as often as men who scored somewhat lower, i.e., had B+ on both scales or B+ on one and A on the other. She attributes the phenomenon to unconscious bluffing. The overcompensation results in differences in scores on other scales. She reports that she takes scores on these secondary interests into account in evaluating beginners who rate A on both primary scales.

Data investigated by the writer throw some light on the situation. Blind advertisements were run in newspapers requesting those interested in selling to answer in writing giving their qualifications. Those whose letters appeared promising were called in for personal interview. Here the proposition to sell life insurance was explained and the candidates were asked to assemble on a certain evening when the writer would explain his interest test and they would be given the test free of charge. They were told that only those who passed would be considered further. How many of the 118 men really desired to secure a position selling life insurance is unknown; the writer knows that some took the test out of mere curiosity and others because they seriously desired to know their true score. The distribution of life-insurance interest scores of the 118 men is:

75	1		
70	0		
65	0		
60	4	A rating	33.9 per cent
55	5		
50	16		
45	14		
40	28	B+ rating	23.7 per cent
35	13	B rating	11.0 per cent
30	13	B− rating	11.0 per cent
25	9	C+ rating	7.6 per cent
20	11		
15	1	C rating	12.6 per cent
10	3		

The mean standard score of this group is 40.4, which is much higher than would be obtained from any random sampling. The

[17] M. A. Bills, "Selection of Casualty and Life-Insurance Agents," *Journal of Applied Psychology* (1941), **25**, 6–10.

distribution of scores differs greatly, however, from the data of Stanford University seniors retested five years later.

The 118 men are subdivided in Table 183 according to their stated occupation. Mean scores for each subgroup are given on

TABLE 183

SUBDIVISION OF 118 APPLICANTS TO SELL LIFE INSURANCE ACCORDING TO THEIR PRESENT OCCUPATION, SHOWING THEIR SCORE ON LIFE INSURANCE AND THEIR OWN OCCUPATION

Occupation	N	Score in Life Insurance	Score in Own Occupation
Group I (Artist, etc.)	2	27	38
Group II (Engineer)	4	27	45
Group III (Production manager)	3	32	32
Group IV (Farmer)	3	37	44
Group V (Personnel)	2	28	48
Group VIII (Accountant)	22	38	40
Group IX (Sales)	12	52	54
Group X (Lawyer)	3	39	42
Unskilled to skilled men	15	37	
Retailer	3	31	
Service station	4	39	
Salesmen to consumers	12	43	
Auto salesmen	4	58	
Salesmen to retailers	9	43	
Salesmen, miscellaneous	6	44	
Miscellaneous	14	36	
Total	118	40	

the life-insurance scale and their own occupation. The second set of mean scores are for the most part fairly typical of men in those occupations who are not considering life insurance as a career. When it is taken into account that these men were looking for a better position because they were presumably not satisfied with their present employment and were willing to consider a sales opportunity, it is to be expected that they would average lower in their own occupation than our criterion group and should average higher in selling than a random sampling of men. With one exception (Group IX, sales) they score below 50, the mean score for criterion groups. But only those subgroups actually engaged in selling scored 40 or higher in life insurance. The data, accordingly, do not indicate that there was any appreciable fudging of

responses in this particular case, although it is entirely possible that this did occur with a few individuals.

When the interest test is given as a selection device it is desirable to emphasize speed in filling out the blank. To think out a proper response takes time and if the candidate believes speed is considered in scoring he will not be so likely to stop and ponder over his responses. Several things may be done in addition. Very high scores may be viewed as suspicious, for if there is fudging the tendency is to obtain excessively high scores. Scores on secondary interests may be considered as Bills has done. New norms may be developed in which items that are obviously related to the occupation are given weights of only 1 or omitted entirely from the scoring. Finally, proper motivation should be attempted by emphasizing to the candidate that his future will suffer if he gets into a job which he will dislike—that here is an opportunity for him to discover what occupations he really likes.

RIGID ASSIGNMENT OF STUDENTS TO OCCUPATIONS ON BASIS OF HIGHEST INTERESTS

What would happen if students were compelled to enter the occupation on which they rate highest on the interest test? How many should continue in the occupation of their choice on the basis of occupational-interest scores? Into how many other occupations should they be directed on that basis? Answers to these questions were published in connection with a study of dental students.[18] The data are based on the unrevised blank and scales and were limited to scores on twenty-five occupations. If scores had been available on more occupations it is entirely likely that at least a fraction of one per cent would have been assigned to all or nearly all the occupations.

The data for one hundred dental students are given in Table 184. Each student is assigned to the occupation in which he rates highest. If there are two or more occupations in which he rates equally high, each of them is assigned a proportional fraction of one. Thus dental student No. 2 has A ratings in four occupations. Each of these is given ¼ credit. When all these fractions are

[18] E. K. Strong, Jr., "Selection of Students for Dental Colleges," *Proceedings, Tenth Annual Meeting of American Association of Dental Schools* (1933), pp. 121–33.

TABLE 184

OCCUPATIONS TO WHICH 100 DENTAL STUDENTS WOULD BE ASSIGNED IF EACH ENTERED THE OCCUPATION IN WHICH HE RECEIVED THE HIGHEST INTEREST RATING

(Original scales)

Occupational Group	Occupations	Correlation with Dentist Interest	Rating in Dentist Interest					Total
			A	B+	B	B—	C	
I	Dentist	...	20.0	3.2	.3			23.4
	Physician	.83	10.2	6.7	1.6	1.5		20.0
	Chemist	.72	3.0	1.1	1.0			5.1
	Physicist	.72	.2					0.2
	Architect	.68	.6					0.6
	Farmer	.66	4.9	3.9	1.5			10.3
	Engineer	.65	1.5	.8				2.2
	Mathematician	.59			.3			0.3
	Psychologist	.51				.5		0.5
	Total		40.3	15.7	4.7	2.0		62.6
IIIa	School man	.17	.3	3.9	1.2	.3		5.6
	Minister	.09		.3	.2			.5
	Total		.3	4.2	1.3	.3		6.1
IV	Purchasing agent	—.04	.6	.8	2.0	.3		3.7
	Office man	—.13		1.0	.5	1.2	.3	2.9
	Accountant	—.21						
	Vacuum cleaner salesman	—.35			.3	1.2		1.5
	Total		.6	1.8	2.8	2.7	.3	8.2
V	Certified public accountant	—.22						
IIIb	Y.M.C.A. secretary	—.32			.2			0.2
	Y.M.C.A. physical director	.06	1.6	3.2	4.0	1.0	.5	10.3
	Personnel manager	—.39				1.0	1.5	2.5
	City school superintendent	—.26			.2	.3		0.4
	Total		1.6	3.2	4.3	2.3	2.0	13.2
IIa	Journalist	—.23	.3		1.8	1.0	1.5	4.6
	Lawyer	—.26		.5	.5	.6		1.6
	Advertising man	—.49						
	Total		.3	.5	2.3	1.6	1.5	6.2
IIIb	Real estate salesman	—.57		.5	.3	1.3	.8	2.9
	Life insurance salesman	—.58			.3		.3	.6
	Total			.5	.5	1.3	1.2	3.4
	Grand total		43.0	26.0	16.0	10.0	5.0	100.0

added up for the one hundred dental students, we have the results in the table.

The 43 dental students obtaining an A rating in dentistry would be distributed as follows: 20 in dentistry, 10 in medicine, 4.9 in farming, 3 in chemistry, 1.6 in Y.M.C.A. physical director, 1.5 in engineering, and 1.8 in five other occupations.

Among the 26 dental students with B+ ratings in dentistry, only 3.2 would continue in dentistry and the remainder would be reassigned to eleven other occupations, mainly medicine, education, farming, and chemistry. Among the 16 dental students with B ratings, only .25 would go into dentistry, 4.5 would go into other scientific activities, and the remainder into occupations not related at all to dentistry. The record is still worse in this respect for the 15 dental students who rate B— and C in dentistry. Not a single one of those rated C would have entered any occupation at all related to dentistry. The reason so few rated B, B—, and C enter dentistry is that they have higher ratings than those in other occupations and so are assigned there.

The data make clear that many of the dental students have chosen an occupation for which they have less interest than one or more other occupations. If all men were required to enter the occupation of their major interest[19] there would be a grand reassignment of students in all our colleges. Possibly this would be a good thing. But we are certainly not ready to advocate such a move today. There are too many other factors which must be taken into account, factors such as ability, financial resources, opportunity to start business with father or some friend, and the like. A young man with interest ratings of B+ in dentistry and A in chemistry who wants to practice dentistry with his father had presumably better pursue that program than enter chemistry.

Today most employers and educational institutions are satisfied if the employee, or student, does satisfactory work. Some of the unrest of the world is surely caused by people working at jobs and studies they don't like, even if they are getting by. Some day the principles of vocational guidance will be employed as well

[19] The data have been handled on the basis of the single highest interest score. Chapter 17 has emphasized the need of taking the whole interest profile into account. Whether the highest single score or the whole profile is used as a measure of "major interest," it is still true that "there would be a grand reassignment of students."

as those of vocational selection. Then there will be concern for fitting not only men into jobs but jobs to men. At the present time, how many employers or educational institutions would consider transferring a first-rate man to a rival concern because it was known he was better fitted for the new position? How many employers or educational institutions make any effort to find out whether or not a good man is in the proper place? Having made such an effort, how many do anything about it? Some concern is shown in some places for the poor employee or inferior student. But why shouldn't we do more about the man who does good work?

Chapter 27. Supplementary Items

This chapter contains detailed information regarding criterion groups upon which the interest scales are based; correlations between scores on interest scales; scores on interest scales of certain age, educational, and occupational groups; certain information regarding the 1938 revision of the men's blank and scales; and a reproduction of the *Vocational Interest Blank for Men* (form M).

OCCUPATIONAL CRITERION GROUPS OF MEN

A brief characterization of each of the occupational criterion groups, together with the number upon which norms are based, is given below. All members had been engaged in their occupation for at least the three previous years; no one was over 60 years of age.

Accountant (338 and 345).[1] Includes 160 general accountants, 54 cost accountants, 65 auditors, and 66 comptrollers and treasurers. Chiefly from Middle Atlantic, Great Lakes, and Pacific Coast states. Average age = 37.4 years; average education = 12.3 grade.

Advertising Man (168 + 62 and 168). Includes 103 advertising managers and 65 advertising-agency men; also includes 62 agency advertisers responding on Cowdery blank. Chiefly from the Middle Atlantic, Great Lakes, and Pacific Coast states. Average age = 37.6 years; average education = 14.0 grade.

Architect (244 and 241). Members of the California State Board of Architecture. Average age = 42.8 years; average education = 14.4 grade.

[1] The first number within the parentheses is the number of blanks used in developing the scale; the second number is the number used in determining the norms. For most of the scales the "norm" blanks are the same blanks (sometimes slightly increased or decreased in number) as were used as the criterion for developing the scale. In the case of Advertising Man the first number is given as 168+62: the first of these two is the number of standard blanks used, the second is the number of Cowdery blanks used. As there are 166 items common to these two forms, the scale is based on 234 items from 168 cases and on 166 items from 230 cases.

Artist (232 + 46 and 231). Includes 124 painters, 79 commercial artists, 20 sculptors, and 9 cartoonists. Average age = 42.7 years; average education = 11.9 grade.

Author-Journalist (250 and 249). Authors so listed in *Who's Who in America;* newspaper editors so designated in *Editor and Publisher Yearbook.* Includes 149 journalists, 68 authors of fiction, 25 authors of nonfiction, and 7 playwrights and poets. Average age = 45.0 years; average education = 14.3 grade.

Aviator (510 and 510). Includes 101 Army, 71 Navy, 215 transport pilots and 125 CAA instructors, with 4 to 25 years' experience (average 10.6 years) and 1,000 to 12,000 hours (average 3,724 hours) of flying. (Prepared with the co-operation of Dr. Eric Liljencrantz.)

Banker (250 and 247). Of these 172 are members of the Minneapolis Federal Reserve System; of this number, 95 are bankers from state banks in Minnesota which opened immediately after the 1933 bank holiday and 77 are bankers from national banks and designated as "good bankers" by a qualified expert. The remaining blanks were obtained through the Psychological Corporation in New York City and from miscellaneous sources. Average age = 45.5 years; average education = 12.2 grade.

Carpenter (185 and 181). Union members. Of these, 55 per cent are from California, 24 per cent from Minnesota, and the remaining 21 per cent from the rest of the country. Average age = 43.2 years; average education = 12.2 grade.

Certified Public Accountant (355 + 68 and 354). So certified in the states of New York and California. Average age = 37.3 years; average education = 14.3 grade.

Chemist (293 and 297). Members of the American Chemical Society; college professors not included. Primarily from the Middle Atlantic, Great Lakes, and Middle Western states. Average age = 35.2 years; average education = 16.8 grade.

City School Superintendent (190 and 190). From cities of 10,000 population or over in all sections of the United States. Average age = 46.5 years; average education = 16.9 grade.

Coast Guard of United States (256 and 256). Includes 17 captains, 35 commanders, 36 lieutenant commanders, 62 lieutenants, 55 lieutenants (junior grade), and 51 ensigns. (Prepared with co-operation of Commander Ellis Reed Hill. Not published.)

Dentist (249 and 239). Representative sampling of dentists in California. These blanks were obtained through the late Dr. A. R. McDowell, Dean of the College of Physicians and Surgeons of San Francisco. Average age = 42.4 years; average education = 14.9 grade.

Engineer (513 and 513). Includes 92 mining engineers, 126 mechanical engineers, 147 civil engineers, and 148 electrical engineers. Three-fourths are full members and one-fourth are associate members of the four engineering societies. Primarily from Middle Atlantic, Great Lakes, and Pacific Coast states. Average age = 43.9 years; average education = 15.4 grade.

Farmer (245 and 241). Of these 75 per cent are graduates of either California or Oregon agricultural colleges with at least five years of subsequent experience in farming. Remaining 25 per cent are noncollege graduates but with at least three years actual farming experience. Average age = 37.6 years; average education = 14.6 grade.

Forest Service (410 and 405). Includes 190 District Rangers, 160 Forest Supervisors, and 60 Foresters. The blanks were obtained through P. P. Pitchlynn, Assistant Regional Forester, U.S. Forest Service, San Francisco. Average age = 38.5 years; average education = 14.2 grade.

Lawyer (251 + 73 and 251). Includes 174 lawyers in general civil practice, 53 corporation lawyers, and 24 criminal lawyers, judges, and district attorneys. All members of the California Bar Association. Average age = 39.2 years; average education = 17.0 grade.

Life Insurance Salesman (514 + 82 and 315). Includes 204 managers, 225 agents (salesmen) averaging at least $100,000 paid-for business during a three-year period, and 167 agents averaging at least $200,000 paid-for business during a three-year period. Of the above-named agents, at least ninety have the title, Chartered Insurance Underwriter. About one-half of the agents are from the Phoenix Mutual Life Insurance Company; the remainder of the agents and the managers are from about 50 different life insurance companies. Average age = 39.9 years; average education = 13.6 grade.

Mathematician (181 and 181). So designated in *American Men of Science;* college professors included. Average age = 46.1 years; average education = 18.8 grade.

Mathematics-Science Teacher (228 and 237). Includes high-school teachers of mathematics and of the physical and biological sciences. These blanks are from the state of Minnesota, obtained through T. J. Berning of the Department of Education of Minnesota. Average age = 33.6 years; average education = 16.4 grade.

Minister (255 and 250). Includes 112 Presbyterian ministers and 85 Methodist ministers; the remaining 48 cases are divided among the other denominations. More than three-fifths are from the Pacific Coast; the remaining two-fifths represent equally the rest of the country. Average age = 42.6 years; average education = 18.2 grade.

Musician (250 and 250). Professional musicians. Includes 43 teachers of music, 40 members of symphony orchestras, 96 members of dance bands, and 71 miscellaneous musicians. Blanks obtained through D. H. Dabelstein of the University of Minnesota and through the San Francisco Local of the American Federation of Musicians. Average age = 32.6 years; average education = 12.4 grade.

Office Worker (326 and 317). Includes 214 office clerks, bookkeepers, and stenographers, 92 office managers, and 20 credit managers. Equally drawn from the whole United States. Average age = 33.2 years; average education = 11.5 grade.

Osteopath (585 and 585). Blanks from qualified alumni of schools of osteopathy located at Kirksville, Missouri, Philadelphia, Kansas City, Chicago, Des Moines, and Los Angeles. Average age = 37.9 years. (Prepared with the co-operation of Thomas C. Schumaker.)

Personnel Manager (147 and 146). Carefully selected by competent authorities. Primarily from New England, Middle Atlantic, Great Lakes, and Pacific Coast states. Average age = 41.0 years; average education = 14.7 grade.

Physician (336 + 96 and 337). Graduates of Yale and Stanford Medical schools; includes 262 physicians and 75 surgeons (no difference of interest between them); 253 are from California, 47 from Connecticut, and 9 from New York; the rest are scattered. Average age = 40.9 years; average education = 18.5 grade.

Physicist (173 and 173). So designated in *American Men of Science;* college professors included. Average age = 43.2 years; average education = 18.5 grade.

Policeman (259 and 254). From cities of Berkeley, Los Angeles, and Palo Alto, California; Cincinnati, Ohio; Duluth, Minnesota; and Wichita, Kansas. Average age = 34.8 years; average education = 10.4 grade.

President of Manufacturing Company (172 and 169). Includes 73 blanks obtained through the Psychological Corporation, 89 blanks returned from mailings made to presidents of manufacturing concerns as listed in *Thomas' Register of American Manufacturers* and *Moody's Industrials,* and 10 blanks obtained from miscellaneous sources. Primarily from Middle Atlantic and Great Lakes states. Average age = 48.0 years; average education = 13.1 grade.

Printer (258 and 279). Includes 82 linotype operators, 86 compositors, 39 proprietors and foremen of printing shops, and 74 printers carrying on varied duties. Primarily from the Great Lakes and Pacific Coast states. More than a third of the blanks were obtained through the Oakland, California, Typographical Union. Average age = 35.5 years; average education = 10.8 grade.

Production Manager (218 and 216). Includes 114 blanks obtained through the Psychological Corporation, 28 blanks returned from mailings made to production managers as listed in *Thomas' Register of American Manufacturers*, and 76 from miscellaneous sources. Primarily from the Great Lakes and Middle Atlantic states. Average age = 42.8 years; average education = 13.3 grade.

Psychologist (192 and 188). Full members of the American Psychological Association. Constitutes a sample of 35 per cent of all full members. Average age = 42.2 years; average education =19.0 grade.

Public Utility Salesman (180 and 180). Includes 115 domestic and 62 commercial, industrial, and agricultural salesmen of one company. (Not published.)

Purchasing Agent (221 and 219). Members of the Purchasing Agents Associations of Northern California, of Los Angeles, California, of Washington, D.C., and of Cleveland, Ohio. Average age = 39.8 years; average education = 11.8 grade.

Realtor (246 and 243). About half engaged in selling downtown real estate in San Francisco; the names of the other half obtained from *California Real Estate Directory*. Average age = 40.1 years; average education = 12.1 grade.

Sales Manager (223 and 228). Obtained through the Psychological Corporation and from the Sales Managers Association of San Francisco. Average age = 42.2 years; average education = 13.0 grade.

Social Science Teacher (224 and 217). Includes high-school teachers of the social sciences. These blanks are from the state of Minnesota and were obtained through T. J. Berning of the Department of Education of Minnesota. Average age = 33.7 years; average education = 16.4 grade.

Y.M.C.A. Physical Director (220 and 215). Selected by the Y.M.C.A. College of Chicago. Primarily from Great Lakes and Middle Atlantic states. Average age = 31.4 years; average education = 14.0 grade.

Y.M.C.A. Secretary (113 and 113). Primarily from Middle Atlantic and Great Lakes states. Average age = 42.0 years; average education = 14.4 grade.

Occupational-Group Scales.—The criterion blanks for occupational-group scales are drawn from the blanks listed. The constitution of the group scales is given in chapter 9.

P_2 *Occupational Scales.*—Scales and norms are based on the same criterion-occupational groups as for P_1 scales, but the men-in-general group is different (see chapter 22).

Date of publication of scales.—The original scales adapted to

the 420-item blank were issued as follows: 1928, Advertiser, Architect, CPA (revised in 1932), Chemist, Engineer, Farmer, Journalist, Lawyer, Life Insurance Salesman, Minister (revised in 1933), Personnel Manager, Psychologist, Purchasing Agent, Realtor, School Man (teacher), Vacuum-Cleaner Salesman, and Y.M.C.A. Secretary; 1929, Physician; 1930, City School Superintendent, Mathematician, Office Man and Physicist; 1931, Boy Scout Master and Y.M.C.A. Physical Director; 1932, Accountant and Dentist; 1933, Artist, Carpenter, and Musician; 1934, Interest Maturity, Masculinity-Femininity, and Policeman.

All of these (except School Man, Vacuum-Cleaner Salesman, and Boy Scout Master) were revised and adapted to the revised blank (Form M) in July 1938. At that time the following new scales were published: Banker, Forest Service, Mathematics-Science High-School Teacher, President of a Manufacturing Concern, Printer, Production Manager, Sales Manager, Social Science Teacher, Occupational Groups I, V, VIII, IX, X. Subsequently the following have been issued: 1939, Occupational Level and Group II; 1940, Aviator; and 1941, Interest Maturity (revised).

OCCUPATIONAL CRITERION GROUPS OF WOMEN

Except where expressly stated otherwise, all members have been engaged in their occupation for at least the three previous years. No one included is over 59 years of age. A very considerable number were obtained through the co-operation of Miss Margaret E. Bennett, Chairman of the National Vocational Guidance Committee of Altrusa. The scales were published in 1935 with the exception of Elementary School Teacher and Physical Education Teacher, which were issued in 1941.

Artist (186 and 184). From those who are listed in *Who's Who in America, Art Annual,* and *Western Advertising Magazine* (April 1934). Includes 126 portrait, landscape, and still-life painters, 23 sculptors, and 37 commercial artists. Average age, 42.4 years; average education, 13.2 grade.

Author (135 and 137). From those listed in *Who's Who in America* and *Who's Who among North American Authors.* Classified by themselves as follows: 74 authors of short stories, articles, fiction, and novels; 23 journalists; 22 authors of children's books; 16 authors of plays and poems. Average age 44.6 years; average education 14.4 grade.

Dentist (101 and 98). From those listed in *Report of the Board of Dental Examiners of California,* members of the Association of American Women Dentists, and classified index of telephone books from many cities in the United States. Total number is small but represents an appreciable percentage of women dentists in the country. Average age, 41.1 years; average education, 15.6 grade.

Elementary Teacher (238 and 238). Elementary teachers rated superior by selected superintendents of schools in Missouri, Nebraska, Kansas, and Iowa. Average age, 36 years; middle half of group range in age from 31 through 42 years. Average education, 15.9 grade; 89 per cent included in grades 15 through 17. Group selected, scale and norms developed by Professor Ralph Bedell, University of Nebraska.[2]

Housewife (1,256 and 500). The group is composed of 648 married women who filled out the women's interest blank and 608 who filled out the men's interest blank. This provides 648 cases for the 148 items not common to the two blanks and 1,256 cases for the 262 items common to both blanks. The majority of married women are members of the Parent-Teachers Association of California; others were included in Professor L. M. Terman's study of married and divorced women; the remainder were from many sources. Average age, 38.2 years, S.D. 8.1; average education, 12.5 grade, S.D. 2.5.

Lawyer (161 and 159). Representative of women lawyers in the larger cities of the country. Primarily from Middle Atlantic, Great Lakes, and Pacific Coast states. Average age, 37 years; average education, 16.2 grade.

Librarian (425 and 427). From a list supplied by the American Library Association. Includes 129 public librarians, 66 college librarians, 48 public-school librarians, 56 reference librarians, 25 children's librarians, 32 catalogers, 44 members of faculty of schools for librarians, and 25 miscellaneous. Average age, 44 years; average education, 16.1 grade.

Life Insurance Saleswoman (76 and 77). Names supplied by twelve life insurance companies of women producers of $100,000 or more paid-for production, through the auspices of the Life Insurance Sales Research Bureau. Includes 33 from Equitable Life Assurance Company, 11 from Penn Mutual Life Insurance Company, 9 from Massachusetts Mutual Life Insurance Company, 23 from nine other companies. They represent an appreciable percentage of women in the United States writing this volume of business. Average age, 46.9 years; average education, 13.5 grade.

[2] See R. Bedell, "The Science Interests of Successful Elementary Teachers," *Science Education,* 1940, **24,** 1–7.

Masculinity-Femininity. Based on the M-F scale for the Vocational Interest Test for Men, utilizing data of the 262 items common to the two blanks. Records from 114 pairs of high-school boys and girls, 154 pairs of college men and women, and 335 pairs of adult men and women were utilized in constructing the scale. Correlation between this scale (262 items) and the scale of 420 items is .87 (based on the records of 150 college men).

Nurse (401 and 396). 313 from New York state, and of these, 283 from New York City. Obtained very largely through the co-operation of Mrs. Eleanor Perry Wood, Educational Records Bureau, New York City. Of the total, 276 are employed in hospitals, 98 as visiting nurses, and 11 as school nurses, and 11 are unclassified. Average age, 34 years; average education, 13.2 grade.

General Office Worker (201 and 226). Representative of office activities in business concerns including purchasing agents, credit managers, bookkeepers, and office managers. Average age, 33.6 years; average education, 12.3 grade.

Physical Education Teacher in High School (250 and 250). Group has had four years' training in physical education and at least five years' teaching experience; 142 from Pennsylvania, 53 from New Jersey, 50 from Minnesota. Average age, 33.4 years; average education, 16.5 grade. Group selected and scale developed by Patricia J. Collins of Temple University.

Physician (196 and 196). Representative of women physicians in the larger cities of the country, over a third from the Middle Atlantic states. Average age, 41 years; average education, 17.4 grade.

Social Worker (175 and 177). From those listed in American Association of Social Workers of Northern California, Seattle-Tacoma, and New York City chapters, together with 25 from membership of Altrusa Clubs. Includes 87 from New York City, 33 from northern California, 16 from Seattle and Tacoma, remainder scattered. Average age, 38.5 years; average education, 15.5 grade.

Stenographer-Secretary (271 and 298). From many sources: 64 from Tennessee Valley Authority, 31 from Altrusa Clubs, 27 from Standard Oil Companies of New York and New Jersey, etc. Average age, 29.3 years; average education, 12.5 grade.

Teacher of English in High Schools (304 and 293). Representative superior and average teachers on the Pacific Coast and in New York City. Average age, 41 years; average education, 16.6 grade.

Teacher of Mathematics and Physical Sciences in High Schools (223 and 247). Representative superior and average teachers on the Pacific Coast and in New York City. Average age, 39 years; average education, 16.6 grade.

Teacher of Social Sciences in High Schools (180 and 194). Representative superior and average teachers on the Pacific Coast and in New York City. Average age, 39 years; average education, 16.5 grade.

Y.W.C.A. Secretary (199 and 202). Blanks secured by National Board of Y.W.C.A. as typical of their experienced staff of secretaries; 42 states and Hawaii represented. Average age, 45.2 years; average education, 15.3 grade.

Revision of Women's Criterion Groups.—In order that there may be a larger and more varied assortment of occupations for which a woman may be scored on the *Vocational Interest Blank for Women*, plans are under way to develop scales for twenty-five occupations, as follows: artist, author, buyer of merchandise, dentist, dietitian, housewife, laboratory technician, lawyer, librarian, life insurance saleswoman, nurse, occupational therapist, office worker, physician, psychologist, saleslady of ready-to-wear, social worker, stenographer-secretary, teacher in elementary school, teacher in high school of (*a*) English, (*b*) home economics, (*c*) mathematics-science, (*d*) physical education, and (*e*) social science, and Y.W.C.A. secretary.

In the light of our findings as to the desirability of criterion groups of 400 to 500 cases (see chapter 24), an effort is being made to obtain 400 cases for each of these 25 occupations.

MEN-IN-GENERAL CRITERION GROUPS

The original occupational scales were based upon the original men-in-general group and the revised scales upon the revised men-in-general group, frequently referred to as P_1.

The original men-in-general group.—Since earlier studies, based upon the original scales, must be interpreted in terms of not only the occupational-criterion groups but also the men-in-general group with which the former were contrasted, the composition of this original men-in-general group is given in Table 185. The group typifies occupations in the upper socio-economic levels—our estimate is that the entire 3,904 men would average 59.7 on the OL scales. As the revised men-in-general group averages 60.0 on this scale, it is apparent that the two men-in-general groups are equivalent in this respect.

The revised men-in-general groups.—When the men's blank and scales were revised in 1938 it was planned to constitute a men-in-general group which would be a good sample of men between the ages of 18 and 60 years, distributed according to age, education, and occupation as given by the *United States Census*. Such

TABLE 185

COMPOSITION OF ORIGINAL MEN-IN-GENERAL GROUP

Occupation	Number of Cases		
	Strong Interest Blanks	Cowdery Interest Blanks	Total
Advertising man	61	49	110
Architect	87	..	87
Artist	49	59	108
Author	69	89	158
Banker	..	73	73
Certified public accountant	59	100	159
Chamber of commerce secretary	13	..	13
Chemist	98	..	98
Credit manager	45	..	45
Engineer	259	..	259
Executive	..	100	100
Farmer	98	..	98
Journalist	56	..	56
Lawyer	194	72	266
Minister	43	100	143
Office man	55	..	55
Personnel manager	120	..	120
Physician	..	95	95
Psychologist	122	..	122
Purchasing agent	71	..	71
Salesman, department store	..	60	60
Salesman, life insurance	131	41	172
Salesman, retail store	..	75	75
Salesman, vacuum cleaner	103	..	103
Sales manager, district	97	..	97
School man (teacher)	154	64	218
Y.M.C.A. secretary	94	..	94
College seniors	849	..	849
Total	2,927	977	3,904

a sample of 1,000 blanks was set up. It is referred to as the "1,000-men group," the "census group," and "P_2." Chapter 21 outlines the reasons that this census group was not used as the revised men-in-general group. Instead a subsample of the 1,000

blanks, representative of the upper occupational strata, was employed for this purpose; it is referred to as the "revised men-in-general group" or as "P_1."

a) The 1,000 men-in-general group (P_2) based on the census: The census group of 1,000 cases is given in Table 186; the census quota for each occupation is shown and also the number of blanks actually employed by us to represent the census quota.

TABLE 186

1,000 MEN-IN-GENERAL GROUP (P_2), BASED ON CENSUS*

Census Designation	Census Quota	Our Quota
Unskilled		
Farm laborers	77	75
Mining operatives	24	12
Laborers, building	27	59
Laborers, manufacturing	62	36
Laborers, railroad	12	11
Fishermen	2	0
Lumbermen	4	3
Garages, teaming, general transportation	4	8
Longshoremen, sailors, deckhands	4	6
Billiard rooms, motion pictures, resorts	2	1
Laborers, road and street	8	8
Public service	5	0
Guards, watchmen	3	4
Soldiers, sailors	4	7
Domestic servants	5	7
Waiters	4	3
Porters, not in stores	3	6
Bootblacks, cleaners, laundrymen, messengers	8	4
Miscellaneous	0	8
Total	258	258

* The three sections including 258 unskilled, 173 semiskilled, and 122 skilled constitute P_2.

TABLE 186 (*Continued*)

Census Designation	Census Quota	Our Quota
Semiskilled		
Manufacturing operatives	53	58
Chauffeurs, truckdrivers	27	27
Millers, furnacemen, oilers	16	12
Painters, glaziers	11	15
Paperhangers, plasterers, stonecutters	5	1
Stationary firemen	3	1
Hostlers, railway firemen, brakemen, streetcar conductors, motormen, switchmen, telephone operators	11	12
Mail carriers	3	3
Deliverymen, teamsters	6	5
Fire department, policemen	5	7
Janitors	6	5
Bakers	4	4
Cooks	5	5
Barbers	7	7
Tailors	4	4
Cleaners, dyers, stewards, cobblers, upholsterers, pleasure resort attendants	6	5
Attendants to professional men	1	2
Total	173	173
Skilled		
Carpenters	23	23
Machinists	21	17
Mechanics, automobile manufacturing, garages	11	8
Electricians	8	11
Plumbers	7	7
Brick and stone masons	4	5
Tinsmiths	2	1
Pattern makers, cabinetmakers	2	9
Blacksmiths	4	1
Mechanics, railway	1	..
Mechanics, other industries	6	11
Stationary enginemen	8	5
Engineers, railway	2	..
Printers, bookbinders, pressmen	6	7
Telegraph operators and linemen	3	5
Conductors, railway	2	..
Inspectors, gaugers, steam railroad	8	6
Aviators, boilerworkers, coopers, glassblowers, jewelers, piano tuners, sawyers	4	6
Total	122	122

TABLE 186 (*Continued*)

Census Designation	Census Quota	Our Quota
Foremen		
Farm foremen and managers	2	2
Lumbering, mining	1	1
Manufacturing	8	8
Railroad, shipping, streetcar	3	3
Road and street, telegraph, telephone, garages	1	1
Total	15	15
Clerical Workers		
Office clerks	34	34
Bookkeepers	7	7
Accountants	5	5
Credit and purchasing	2	2
Collectors, ticket agents, express agents, mail clerks	5	5
Abstractors, postmasters	1	1
Employees, advertising agencies	1	1
Total	55	55
Salesmen		
Sales clerks in stores	45	45
Traveling salesmen	7	7
Insurance agents	6	6
Real estate agents	5	5
Commercial brokers, commission men, stock brokers, etc.	3	3
Total	66	66
Managers and Owners		
Farm owners and managers	132	130
Retail dealers	40	40
Lumbering, mining	1	1
Manufacturing officials	11	11
Manufacturing owners	2	2
Officials, railway, warehouses, stockyards	3	3
Officials, trucking, taxis, garages	3	3
Managers and owners, pleasure resorts	1	1
Managers and owners, restaurants, hotels	5	5
Managers and owners, cleaning, dyeing, laundry	1	1
Wholesale dealers	2	2
Officials, city, county, state, and federal government	4	4
Undertakers	1	1
Bankers and brokers	2	2
Building contractors	4	4
Total	212	212

TABLE 186 (*Concluded*)

Census Designation	Census Quota	Our Quota
Professional Men		
Actors	1	1
Architects, artists, sculptors	2	2
Authors, editors	1	1
Musicians	2	2
Advertisers, photographers, window dressers	1	1
Draftsmen, designers	3	3
Chemists	1	1
Physicians, surgeons, veterinarians	4	4
Engineers	6	6
Dentists	2	2
Clergymen	3	3
College presidents and professors	1	1
Lawyers	4	4
Teachers	6	6
Librarians, social and religious workers, nurses	2	2
Total	39	39
Unemployed		
In school	22	22
Not in school	38	38
Total	60	60
Grand total	1,000	1,000

The occupations listed in the census were classified into fairly large groups of at least 35,000 men and frequently into much larger groups than this number on what seemed to be a reasonable similarity of function. As the sample was to consist of 1,000 blanks this meant one blank for each 35,000 in the 1930 census, since the total number of males between 18 and 60 years of age was then 35,068,768. For each 35,000 in a group a representation was chosen bearing in mind the blanks in our files. Thus, in the group composed of firemen and policemen seven blanks of the latter were chosen instead of five from the two classifications because we had no blanks of fireman; the two extra policemen being included to make up a shortage of one from the deliveryman-teamster group and one from the janitor group. In many cases the sample is an extremely good representation of the census quota; in other cases it is as described in the preceding sentence.

Anyone familiar with census figures knows that it is not easy to decide from the data how many men belong in a given functional class, since the data are assembled on an industry basis. Carpenters, for example, are grouped not under one functional heading but under many different industries. We have reassembled the census data so as to best fit our needs. When our subgroups are compared in Table 187 with those of Edwards, Director

TABLE 187

SUBCLASSES OF MEN, 18–60 YEARS OF AGE, ACCORDING TO EDWARDS* AND STRONG

Classification by Edwards		Classification Used in This Study		
Group	Percentage	Group	Percentage[a]	Percentage[b]
Unskilled	28.6	Unskilled	27.5	25.8
Semiskilled	14.3	Semiskilled	18.4	17.3
Skilled and foremen	16.3	Skilled	13.0	12.2
		Foremen	1.6	1.5
Clerks	12.8	Clerical	5.9	5.5
		Salesmen	7.0	6.6
Proprietors, managers, and owners:				
Farm owners and tenants	15.1	Farm owners and managers	14.0	13.2
Wholesale and retail dealers	4.4	Wholesale and retail	4.5	4.2
Other proprietors, etc.	4.6	Others	4.0	3.8
Professional	3.9	Professional	4.1	3.9
		Unemployed	....	6.0
Total	100.0		100.0	100.0

* A. M. Edwards, "A Social Economic Grouping of the Gainful Workers in the United States," *Journal of the American Statistical Association*, 1933, Vol. 28, pp. 377–87, and his bulletin of the same title, Bureau of the Census, 1938.

[a] Percentages in this column of data exclude unemployed, in order to facilitate comparison between our data and those of Edwards.

[b] The third column includes 6 per cent unemployed, as in Table 186.

of the Census of Occupations in the Census Bureau, it is apparent that there is close agreement. The chief difference between the two sets of data is presumably caused by different definitions of unskilled, semiskilled, and skilled occupations.

Table 188 gives the distribution of the subgroups by age (1) according to the census data and (2) according to the blanks used in the 1,000-men group. The two samples do not agree in every

particular. The differences are, however, of minor significance as far as this study goes, since our sample averages but one year less in age than the census data (35.1 and 36.3 years, respectively). Table 189 gives the distribution of the subgroups of our 1,000 blanks by years of schooling. The average grade reached

TABLE 188

AGE DISTRIBUTION OF 1,000 MEN CONSTITUTING P_2, REPRESENTATIVE OF ADULT MALE POPULATION

Classification	Age Groups								Total Number	Mean Age
	18–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59		
	1. ACCORDING TO U.S. CENSUS									
In school	22								22	21.5
Not in school	13	4	3	3	3	3	4	5	38	35.9
Unskilled	80	39	31	28	25	23	18	14	258	33.9
Semiskilled	32	26	23	27	21	19	14	11	173	36.3
Skilled	16	19	19	20	17	12	10	9	122	37.4
Foreman	1	2	2	3	2	2	2	1	15	39.7
Clerical	18	10	8	6	5	4	3	1	55	32.0
Salesman	14	11	10	9	7	7	5	3	66	35.2
Owners	16	21	28	32	33	31	29	22	212	40.9
Professional	5	7	6	5	5	4	4	3	39	37.5
Total	217	139	130	133	118	105	89	69	1,000	36.3
	2 ACTUAL DISTRIBUTION BY BLANKS USED									
In school	22								22	21.5
Not in school	13	4	3	3	3	5	1	6	38	35.8
Unskilled	74	46	35	38	19	23	13	10	258	33.2
Semiskilled	38	30	26	28	20	11	13	7	173	34.6
Skilled	13	20	19	25	13	14	7	11	122	37.6
Foreman	1	2	2	3	2	3	2	0	15	39.0
Clerical	16	12	8	8	5	3	1	2	55	31.8
Salesman	18	13	8	9	5	5	5	3	66	33.6
Owners	6	33	25	26	33	39	30	20	212	41.5
Professional	5	7	6	5	5	4	4	3	39	37.5
Total	206	167	132	145	105	107	76	62	1,000	35.1

is 10.2, which is higher than that for the general population. There seem to be no authoritative data as to how much education adult men have obtained. Dr. David Segel of the Office of Education, United States Department of the Interior, very kindly supplied us in 1934 with the estimates given in the last column of the

table.[3] On this basis our sample has had about two and a half years more education than the general population. This points to a constant error in much of our data—our samples are better educated than the populations from which they are drawn. The explanation is presumably to be found in the reluctance of the more poorly educated to fill out the interest blank. Since the oncoming generation is much better educated than the present one, this discrepancy is an actual advantage from the standpoint of present-day guidance.[4]

TABLE 189

EDUCATION OF 1,000 CENSUS GROUP (P_2; SEE TABLE 186)

(Figures = Average School Grade reached)

No.	Classification	Age Groups								Total
		18–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	
38	Unemployed ...	9.5	11.3	11.3	10.0	10.7	10.2	12.0	8.8	10.1
22	Students	14.2	....	....	....	....	....	....	....	14.2
258	Unskilled	9.6	8.5	10.8	9.4	9.5	8.2	7.7	8.3	9.2
173	Semiskilled	10.0	9.0	8.0	7.9	7.8	8.5	8.0	7.3	8.5
122	Skilled	10.1	9.6	8.5	9.2	9.1	6.9	7.3	8.0	8.8
15	Foremen	16.0	12.0	8.0	9.0	10.0	9.0	8.0	....	9.7
55	Clerical	11.9	11.1	11.0	10.1	11.0	11.0	12.0	8.0	10.9
66	Salesmen	12.4	13.1	12.9	10.9	12.3	11.1	12.5	13.0	12.3
212	Managers and owners	14.1	14.8	11.8	10.8	11.1	11.0	11.0	9.5	11.6
39	Professional...	14.5	15.6	15.3	14.6	13.4	17.0	14.5	16.7	15.2
1000	Average.....	10.9	10.9	10.2	9.6	10.1	9.7	10.0	9.2	10.2

The 1,000 Census Group has a mean score of 50 (σ is 10) on the OL scale, of 47.8 (σ is 9.4) on the MF scale, and of 52.9 (σ is 9.0) on the 15–25-year IM scale.

[3] Nine years for the 18–24-year group is supported by data of Foster for children who were in the fifth grade in 1924, but it is one firade high in terms of a bulletin of the Office of Education, which states "the median education in 1934 is only completion of elementary school" (up to and including the eighth grade). E. M. Foster, "School Survival Rates," *School Life*, 1936, **22**, 13–14, and 1938, **23**, 265–67, and U.S. Office of Education Bulletin, No. 2, 1935, *Biennial Survey of Education, 1932–1934.*

[4] Segel wrote in 1934: "According to the figures now attending school, the age group 20–29 ten years from now will have an educational grade status of about 10.0 not including the effect of white immigration."

Data regarding amount of education of men admitted to the United States Army in 1941 indicate average schooling of 9.5 years.

b) *The "Revised Men-in-General Group"* (P_1): This is the men-in-general group in terms of which the regular (P_1) scales are developed. It is a subsample of the 1,000 Census Group, which represents business and professional men earning roughly $2,500 a year and upward. Its composition is shown in Table 190. Business occupations with low mean income have been excluded or reduced in size as explained in the footnotes to the table. This explains why the "quota used" differs from "number per 1,000 in census."

In order that the interests of this business-professional group should be determined with considerable accuracy, a considerable number of blanks were averaged to represent the various occupations instead of basing the calculations upon a single interest blank representative of each occupation. Thus 114 interest blanks of architects were averaged and the average was used to typify the interests of one architect. In the case of physicians, 337 blanks were averaged and the averages weighted by four were included in the final summary. A single architect's blank influenced the final summary by $1/114 \times 1/106$, or .000082; a single physician's blank by $4/337 \times 1/106$, or .000111; whereas a single blank of a trucking and taxi official counted $\frac{3}{4} \times 1/106$, or .007075. All in all, 4,746 blanks were used as the basis of the interests of the business-professional group.

We do not maintain that the revised men-in-general group is a perfect sampling of business and professional men, but we do believe that it is a fair representation of such a sampling and about as good as we could secure with the finances at our disposal.[5]

c) *The unskilled, semiskilled, and skilled men-in-general group* (P_3): This men-in-general group has been used for developing a few P_3 scales for theoretical purposes concerning the point of reference (see chapters 21 and 22). It comprises the 258 unskilled, 173 semiskilled, and 122 skilled men, a total of 553 of the 1,000 cases in P_2 (see Table 186). Whereas P_1 is representative of approximately ten per cent of the adult male popu-

[5] Nearly all groups have co-operated surprisingly well in this study, with the striking exceptions of carpenters and presidents of manufacturing concerns. The few blanks we have of these two occupations have cost us probably five dollars apiece. These few blanks cannot be accepted as good samples of the two occupations, for they represent less than ten per cent of those contacted.

lation drawn from the upper socio-economic levels, P_3 is representative of half of the male population drawn from the lower socio-economic levels.

TABLE 190

COMPOSITION OF THE REVISED "MEN-IN-GENERAL" GROUP (P_1), REPRESENTATIVE OF PROFESSIONAL AND BUSINESS MEN EARNING $2,500 A YEAR AND UPWARD

Occupations According to Census	Number per 1,000 in Census	Occupations Used in "Men-in-General Group"	Quota Used	Number of Interest Blanks Used
Professional men[a]		*Professional men*		
Actor	1			
Architect	1	Architect	1	114
Artist, sculptor	1	Artist	1	226
Author, editor	1	Editor, journalist	1	122
Advertising agent, photographer, window decorator	1	Advertising man	1	60
Chemist	1	Chemist	1	148
College president and professor	1	College professor[b]	1	564
Dentist	2	Dentist	2	238
Engineer	6	Engineer	6	382
Lawyer	4	Lawyer	4	195
Librarian, social and religious worker, nurse	2	Y.M.C.A. secretary	2	99
Minister	3	Minister	3	245
Physician, surgeon, veterinarian	4	Physician, surgeon	4	337
Teacher	6	Teacher[c]	6	282
		City school superintendent	1	193
		Certified public accountant	1	329
Total	34	Total	33	3,534

[a] Musician (weight of 2) and draftsman, designer (3) were excluded from the professional group (see Table 186), since musician is grouped among skilled labor on the basis of interests and not among professional men, while as a group draftsmen do not earn $2,500.

[b] These were 201 mathematicians, 203 physicists, and 129 psychologists, each group weighted two, plus 31 miscellaneous professors counted one each; all combined, counted one thirty-fifth of the professional group.

[c] Teacher should have been given a quota of 5, since city school superintendent was also included in order to represent the administrative element among teachers in general.

TABLE 190 (*Concluded*)

Occupations According to Census	Number per 1,000 in Census	Occupations Used in "Men-in-General Group"	Quota Used	Number of Interest Blanks Used
Business men[a]		*Business men*		
Farm owner and manager	132	Farm owner and manager	13	50
Retail dealer	40	Retail owner	4	25
Lumbering, mining official	1	Lumbering official	1	5
Manufacturing owner	5	President, owner, manufacturing concern	7	50
Manufacturing official	8	Sales manager	2	25
		Production manager	2	25
		Advertising manager	2	25
Official, railroad, warehouse, stockyard	3	Official of railroad	3	7
Official, trucking, taxi, garage	3	Official, trucking, taxi	3	4
Manager and owner, restaurant, boarding house, and hotel	5	Hotel manager and owner	2	25
Wholesale dealer	2	Wholesale dealer	2	5
Official, city, county, state, and federal	4	Government official	4	7
Undertaker	1	Undertaker	1	4
Banker and broker	2	Banker	2	50
Building contractor	4	Building contractor	4	6
Office clerk	34	Office manager	1	50
Accountant	5	Accountant	5	332
Credit manager	1	Credit manager	1	14
Purchasing agent	1	Purchasing agent	1	120
Traveling salesman	7	Traveling salesman	5	25
Insurance agent	6	Life insurance salesman	2	220
Real estate agent	5	Real estate salesman	2	126
Commercial broker, commission man, stock broker	3	Broker, commercial and financial	2	12
Total	272	Total	71	1,212
Grand Total	306	Grand Total	106	4,746

[a] The following census classifications were not included among "business men" on the ground that as a group they do not earn $2,500: bookkeeper (7), collector, ticket agent, express agent, mail clerk (5), abstracter, postmaster (1), employee, advertising agency (1), sales clerk in store, floorwalker (45), manager and owner of pleasure resort (1), manager and owner of cleaning, dyeing, laundry (1) (see Table 186). In addition the two groups of farm owner and manager and retail dealer were cut to one-tenth their census quota on the ground that only about that percentage earn $2,500 a year. (Several estimates from experts averaged 10 per cent for the farm group. Subsequently Clark reports 12 5 per cent of farm incomes of $2,000 and more for 1922, 16.8 per cent for 1926, 8.6 per cent for 1930, and 7.0 per cent for 1934. The average of these four is 11.2 per cent. See H. F. Clark, *Life Earnings*, [Harper & Bros., 1937], p. 129.) The office-clerk group was cut from 34 to 1 on the ground that only the office manager earned $2,500. The foregoing are only estimates Various calculations indicate that variations in these estimates would not affect the total representation to any great degree.

WOMEN-IN-GENERAL GROUP

The women-in-general group is made up of the following interest blanks: 186 artists, 135 authors, 101 dentists, 161 lawyers, 425 librarians, 45 life insurance saleswomen, 401 nurses, 102 office workers, 196 physicians, 340 social workers, 130 stenographer-secretaries, 304 high-school teachers of English, 223 high-school teachers of mathematics and physical sciences, 180 high-school teachers of social sciences, 198 Y.W.C.A. secretaries, and 1,256 married women—a total of 4,383 blanks. In order to have each occupation equally represented, the data for each group were reduced to percentages and the percentages totaled and divided by seventeen (the married women being given double representation).

CRITERION GROUPS FOR NONOCCUPATIONAL SCALES

The three nonoccupational scales—OL, MF, and IM—are discussed in chapters 10, 11, and 12, respectively. The criterion groups upon which these scales are based are given below.

Criterion groups for the Occupational-Level (OL) scale.—This scale contrasts the interests of 258 unskilled workmen and business-professional men. The former consists of the 258 unskilled men in the 1,000 Census Group (P_2) (see Table 186). (This criterion group should not be confused with P_3). The business-professional group is identical with P_1 (see Table 190). The age, education, and occupational distributions of these two criterion groups are given in Tables 188, 189, and 190.

Criterion groups for Masculinity-Femininity (MF) scale.—Details of the males and females whose interests are contrasted in the MF scale are reported in chapter 11 (see page 217).

Criterion groups for the Interest-Maturity (IM) scales.—Three IM scales are considered here: namely, (1) the original IM scale, (2) the revised 15–25-year IM scale, and (3) the revised 25–55-year IM scale (not published). These three IM scales employed four criterion groups: (*a*) a 15-year-old group, (*b*) a 25-year-old group, (*c*) the revised 55-year-old group, and (*d*) the original 55-year-old group.

a) The 15-year-old criterion group: This criterion group was used with both the original IM scale and the revised 15–25-year IM scale. The distribution of the 472 15-year-old boys according to school grade, in comparison with similar data on school children in California, is given in Table 191.

TABLE 191

COMPOSITION OF 15-YEAR-OLD CRITERION GROUP, ACCORDING TO SCHOOL GRADES, IN COMPARISON WITH DISTRIBUTION OF 15-YEAR-OLDS IN SCHOOLS OF CALIFORNIA

School Grade[a]	15-Year-Old School Children in California		15-Year-Old Criterion Group	
	Total	Percentage	Total	Percentage
Grade 7	4,302	6.83	31	6.5
Grade 8	9,703	15.40	73	15.5
Grade 9	18,674	29.64	140	29.7
Grade 10	19,944	31.65	150	31.8
Grade 11	8,844	14.04	66	14.0
Grade 12	1,539	2.44	12	2.5
Total	63,006	100.00	472	100.0
Average school grade	9.38		9.39	

[a] This table ignores 5.08 per cent reported below the 7th grade and .20 per cent above the 12th grade. It is believed that a large proportion of the 5 08 per cent are to be explained by the abnormal presence here of 102,405 Mexican children under 18 years of age out of a total of 1,209,137 children. Another reason for such exclusion was that those of this age below the 7th grade would have been unable to fill out the *Vocational Interest Blank* used as a basis for the study. From our experience it appears that the *Vocational Interest Blank* cannot be used successfully below age 15. Many boys of this age in the 7th grade required individual aid, for much of the terminology was incomprehensible to them. The 472 records came from 18 school systems in California, 3 in Oregon, and 1 in Washington. Berkeley, California, supplied 95; San Jose, California, 83; Bend, Oregon, 41; Oregon City, Oregon, 27; Palo Alto, California, 26; and Redwood City, California, 23. The blanks were secured through the co-operation of Dr. Gilbert Wrenn and school principals in these school systems.

b) The 25-year-old criterion group: This criterion group was used with both the revised 15–25 and 25–55 IM scales. It is actually composed of 215 men, 23 to 27 years of age. The 153 men in our 1,000 Census Group in this five-year range did not happen to be distributed proportionately to the census data in terms of unskilled, semiskilled, etc. Sixty-two additional cases were added in order to give approximately the correct proportion of unskilled, semiskilled, etc., for the entire group of 215 cases. The entire group had had 11.0 years of schooling (see p. 256).

c) The 55-year criterion group for the revised IM scale: This group includes 151 men between the ages of 50 and 59. As shown in Table 188, 158 men fall in this age range according to the census but only 138 blanks were included in the 1,000 Census Group. In order to improve our sample, 13 additional cases were included so as to give as nearly as possible the correct proportion of men, unskilled, semiskilled, etc. This criterion group had 9.5 years of schooling ($\sigma = 3.4$).

d) The 55-year criterion group for the original IM scale: This group was selected so as to include as wide a variety of occupational interests as possible (see Table 192). Actually, blanks of

TABLE 192

OCCUPATIONAL COMPOSITION OF 55-YEAR-OLD GROUP FOR ORIGINAL IM SCALE

	N		N
Group I:[a]		Group IIIa:	
Architect	17	Minister	50
Artist	26	Teacher	33
Engineer[b]	30		
Mathematician	30	Total	83
Physician[c]	38	Group IIIb:	
Physicist	30	City school superintendent	30
Psychologist	30	Personnel manager	21
Miscellaneous	12	Y.M.C.A. secretary	17
Total	213	Total	68
Group IIa:		Group IV:	
Advertising man	3	Purchasing agent	11
Author	20	Miscellaneous	24
Lawyer	34		
Newspaper editor	36	Total	35
Total	93	Group V:	
		Certified public accountant	13
		Miscellaneous:	
		Hotel manager	17
Group IIb:		Business manager	15
Life insurance salesman	24	Miscellaneous	48
Real estate salesman	9		
Miscellaneous	14	Total	80
Total	47	Grand total	632

[a] Original grouping of occupations used at that time

[b] Actually based on 27 *mining*, 25 *civil*, 23 *electrical*, and 25 *mechanical engineers* but reduced proportionately to equal 30.

[c] Actually based on 76 and reduced to equal 38.

all 55-year-old men in our files were included, except where we had over 30 in an occupation—in such cases approximately 30 were used. But in order to give greater representation to groups II and III, more than 30 were included in four cases. (See also page 247.)

CORRELATIONS BETWEEN INTEREST SCALES

Correlations between interest scales for men's blank.—Intercorrelations between 41 interest scales and intelligence[6] are given in Table 193. The correlation between any two ocupations is between the scores of 285 Stanford University seniors on the two occupational scales. Strictly speaking the correlation is not between the two occupations but is between (*a*) the differences in interests of the first occupation and those of men in general and (*b*) the differences in interests of the second occupation and those of men in general. Data concerning these seniors are given on page 721.

Correlations between interest scales for women's blank.—Correlations between 19 interest scales are given in Table 194. The correlations are based on the scores of the 19 variables on the blanks of 500 married women. The great majority of these women are members of the Congress of Parents and Teachers living in California. Their mean age is 38.2 ($\sigma = 8.0$). On the average they have had 12.4 years of schooling ($\sigma = 2.55$), that is, .4 year in college.

Professor Ralph Bedell of the University of Nebraska has calculated the intercorrelations between 20 scales based on the records from 238 elementary school teachers. The two sets of coefficients correlate .974; their average difference is .084. Laleger[7] has also published intercorrelations between 18 scales based on the records of 703 third-year high-school girls. Her coefficients correlate .85 with ours; the average difference between her coefficients and ours is .155 if the MF scale is omitted and .181 if it is included. Among 136 correlations there are 47 that differ by as much as .20 from ours. Her correlations involving MF correlate only .42 with ours and the average difference between them is

[6] *Thorndike Intelligence Examination for High-School Graduates.*

[7] G. E. Laleger, *The Vocational Interests of High-School Girls* (Teachers College, Columbia University, Contributions to Education, 1942, No. 857), p. 28.

TABLE 194

CORRELATIONS BETWEEN SCORES ON 19 INTEREST SCALES FOR WOMEN

(N = 500 married women)

Occupation	Dentist	Math and Phys. Sci. teacher	Phys. education teacher	Nurse	Housewife	Office worker	Stenographer	Elementary school teacher	Life insurance salesman	Social-science teacher	YWCA secretary	Social worker	Lawyer	English teacher	Librarian	Artist	Author	MF
Physician	.38	.13	—.31	—.19	—.67	—.67	—.75	— 66	—.23	—.21	—.08	.37	.08	—.13	.45	.45	.41	.29
Dentist		.52	.25	.48	.26	.20	.04	.08	—.37	—.34	— 22	—.43	— 40	—.61	—.25	.02	—.35	.29
Mathematics and Physical Science teacher			.46	.42	.29	.33	.09	.33	—.41	.40	28	—.21	.01	—.16	—.36	—.45	—.67	.27
Physical Education teacher				.75	.56	.53	.61	.54	—.13	.19	.12	— 22	—.07	—.13	—.74	—.44	—.63	—.07
Nurse					.59	.55	.57	.55	—.26	.08	.16	—.26	—.19	—.31	—.74	—.48	—.68	—.17
Housewife						.84	.77	.80	—.01	.01	.04	—.68	—.37	—.38	—.74	—.57	—.75	—.03
Office worker							.90	.65	.12	.08	.04	—.60	—.08	—.45	—.77	—.71	—.81	.02
Stenographer-secretary								.64	.11	.00	—.09	—.52	—.12	—.27	—.74	—.55	—.61	—.18
Elementary school teacher									—.17	.28	.24	—.48	—.35	.05	—.66	—.55	—.65	—.37
Life insurance										.01	.09	.14	.35	—.10	—.08	—.20	.02	.15
Social-science teacher											.73	.40	.55	.51	—.19	—.59	—.40	—.18
Y.W.C.A. secretary												.51	.50	.28	—.27	—.64	—.44	—.29
Social worker													.64	.48	.30	.04	.34	—.20
Lawyer														.24	—.04	—.37	—.06	.07
English teacher															.31	.14	.35	—.47
Librarian																.72	.79	.09
Artist																	.85	.07
Author																		—.07

.379. (Her coefficients differ from those of Bedell on the average by .177 if the MF coefficients are omitted and by .200 if they are included. The average difference for the MF coefficients is .376.) It is difficult to believe that the interests of authors, artists, and librarians should correlate .68 to .82 with MF. As pointed out above, the particular blanks used affect the intercorrelations somewhat, but in no other case have we found one set of intercorrelations differing as much from a second set as between Laleger's data and both Bedell's and our own.

INTEREST SCORES OF MEN OF VARIOUS AGES AND OCCUPATIONAL STATUS

Included here are scores on the interest scales of: (1) 15-, 25-, 35-, and 45-year-old men; (2) high-school juniors, college freshmen, and college seniors, both test and retest records; (3) adult men engaged in certain occupations.

Interest scores of 15-, 25-, 35-, and 45-year-old men.—The 15.5-year-old group comprises 100 cases of the 472 boys in the 15-year-old criterion group (see Table 191). The 25-, 35-, and 45-year-old groups comprise the age ranges, respectively, of 24 to 26, 34 to 36, and 44 to 46 of the 1,000 Census Group (see Table 186).

Scores on 34 occupational-interest scales and on the OL and MF scales are given in Table 195 and in Figures 20 and 21, p. 272. Differences between the 15.5- and the 25-year, the 25- and the 35-year, and the 35- and the 45-year-old groups are given in Table 70, p. 267. Certain relationships between the interests of these age groups and IM are indicated in Table 73, p. 270, and Figures 20 and 21.

Interest scores of high-school juniors.—Two hundred and forty-eight high-school juniors were tested in 1930. One year later 108 were retested and again six years later 160 of the 248 filled out the *Vocational Interest Blank.* Their better-than-average, subsequent educational record and the fact that most of the 160 had not changed their residence are indicative that the group is a superior selection from among high-school juniors. In 1930 the mean age of the group is 16.5 years ($\sigma = 1.3$). In 1936, 109 of the 160 reported their educational status, which averaged 15.4 years

TABLE 195

INTEREST SCORES OF MEN AGED 15, 25, 35, AND 45 YEARS, AND HIGH-SCHOOL JUNIORS IN 1930 AND SIX YEARS LATER

Occupation	Four Age Groups[a]				High School Juniors[b]	
	Age 15.5 (N=100)	Age 25 (N=87)	Age 35 (N=64)	Age 45 (N=52)	Age 16.5 in 1930 (N=160)	Age 22.5 in 1936 (N=160)
Artist	30.5	20.4	20.8	21.2	28.7	24.0
Psychologist	14.5	12.3	8.8	10.5	15.8	19.8
Architect	28.5	21.4	22.0	22.1	28.7	25.6
Physician	35.5	25.3	26.9	26.6	33.3	28.2
Dentist	34.8	27.0	29.1	28.5	31.3	28.1
Mathematician	24.7	16.7	15.9	19.0	24.3	20.8
Engineer	34.0	28.4	29.4	28.8	33.3	29.4
Chemist	30.7	23 4	23.3	23.0	31.3	29.6
Production manager	33.5	36.3	38.5	36.6	32.5	35.3
Farmer	46.0	38.1	38.6	44.7	42.7	37.9
Carpenter	38.3	31.2	35.7	36.0	30.5	31.5
Printer	41.4	39.7	37.2	38.0	38.9	41.0
Mathematics-Science teacher	30.7	35.3	32.5	33.7	31.1	37.3
Policeman	38.0	37.5	38.1	36.9	32.8	33.4
Forest service	25.7	27.6	26.5	30.2	27.2	29.5
Y.M.C.A. physical director	23.4	29.9	27.1	25.4	24.0	30.3
Personnel manager	15.8	29.3	26.3	22.9	18.5	31.1
Y.M C.A. secretary	13.7	26.8	23.6	24.9	15.6	24.7
Social science teacher	21.2	32.8	27.1	30.2	22.8	32.4
City school superintendent	8.3	20.7	16.2	18.9	12.2	21.0
Minister	10.2	20.6	17.0	18.7	11.6	19.5
Musician	33.5	29.9	26.7	26.3	33.5	35.9
Certified public accountant	18.9	22.9	20.1	16.8	22.8	25.8
Accountant	23.5	35.2	31.7	30.9	25.7	32.5
Office worker	32.2	41.6	39.0	37.9	32.4	37.9
Purchasing agent	33.0	35.7	36.0	34.0	33.9	34.7
Banker	32.9	34.1	35.9	36 3	29.9	29.7
Sales manager	26.5	31.2	32.3	28.6	29.3	30.5
Real estate salesman	39.4	37.2	39.5	36.2	38.4	35.8
Life insurance salesman	28.3	31 6	32.7	28.9	28.4	28.1
Advertising man	29.4	28.3	27.0	25.7	30.8	31.2
Lawyer	28.8	26.8	24.4	23.5	31.1	29.7
Author-journalist	33.9	27.0	26.3	26.4	32.9	29.5
President	31.0	29.4	32.4	31.2	30.6	28.0
Occupational Level	47.3	50.2	50.2	49.8	51.3	51.8
Masculinity-Femininity	51.9	48.7	49.5	50.6	50.2	49.4
Interest Maturity	....	....	....	....	43.8	52.5
Average of 34 Occupational Scales	28.6	29.2	28.4	28.2	28.4	30.0

[a] Standard deviations of 15.5-, 25-, 35-, and 45-year groups are, respectively: on artist, 9.6, 9.3, 8.8, and 9.1; on physician, 8.7, 9.9, 9.9, and 8.9; on printer, 9.9, 12.5, 14.3, and 11.7; on personnel, 11.6, 12.8, 12 8, 13 2; on Y.M.C.A., 13.6, 13.0, 12.5, and 14.7; and on purchasing agent, 6.9, 10.2, 9.3, and 10.3.

[b] Standard deviations of 16.5- and 22.5-year-old high-school juniors are, respectively: on artist, 10.3 and 11.1; on physician, 11.7 and 12.6; on printer, 9.0 and 10.1; on personnel, 11.7 and 11.1; on Y.M.C.A., 13.1 and 12 6; and on purchasing agent, 7.9 and 11.1.

(.6 year less than graduation from college). If it is assumed that the 51 who did not report their education averaged graduation from high school, the mean education of the group would be 14.3 years.

Scores for this group on test and retest on 34 occupational scales and on the OL, MF, and IM scales are given in Table 195. Differences between the two sets of scores are given in Table 70, p. 267. Percentages of A, B+, B, and C ratings on the original test are given in Table 107, p. 376. Correlations between test and retest on six of the occupational scales are given in Table 95, p. 360.

Interest scores of college freshmen.—In 1930 the freshmen at Stanford University were invited to take the vocational-interest test with the offer that their scores would be given them at no expense. This group averaged 18.7 years of age in 1930. Of the 306 who responded, 256 repeated the test a year later and 175 took the test again in 1939. Only 159 took the test on all three occasions.

Scores for the 159 freshmen in 1930, 1931, and 1939 on 34 occupational-interest scales and on the OL, MF, and IM scales are given in Table 196. Differences between the 1930 and 1939 test scores of 174 men who took both tests are given in Table 70, p. 267. Percentages of A, B+, B, and C ratings of the 306 freshmen who filled out the blank in 1930 are given in Table 107, p. 376. Correlations between test and retest in 1931 on ten of the occupational scales and between test and retest in 1939 on six of the scales are given in Table 95, p. 360.

Interest scores of college seniors.—Slightly over two-thirds of the Stanford University seniors, i.e., 287 men, filled out the *Vocational Interest Blank* in 1927. Five years later 223 repeated the test, and again in 1937 there were 197 who filled out the blank. Only 168 took the test on all three occasions. The mean age of the 287 seniors was 22.4 years ($\sigma = 1.91$).

Scores for the 168 college seniors in 1927, 1932, and 1937 on 34 occupational-interest scales and on the OL, MF, and IM scales are given in Table 196[8]. Differences between the 1927 and

[8] Test and 1937 retest scores of many of the seniors are given in Tables 110 and 113, pp. 394 and 398.

TABLE 196

INTEREST SCORES OF COLLEGE FRESHMEN AND SENIORS—ORIGINAL TEST AND RETESTS

Scale	159 College Freshmen			168 College Seniors					
				Age 22.4 in 1927		Age 27.4 in 1932		Age 32.4 in 1937	
	Age 18.7 1930	Age 19.7 1931	Age 27.7 1939	Mean	σ	Mean	σ	Mean	σ
Artist	24 3	23.3	24.8	24.6	10.9	24.7	11.8	21.0	11.5
Psychologist	19.1	20.9	24.7	21.0	14.0	24.5	15.7	25.0	15.5
Architect	24.7	24.1	27.1	25.4	11.6	26.8	12.5	26.8	12.4
Physician	30.5	28.8	30.1	30.2	13.7	31.5	14.7	30.6	13.8
Dentist	26 6	25.1	24.6	25.3	12.5	25.6	12.8	25.8	12.6
Mathematician	23 2	22.8	24.7	21.9	13.0	24.9	13.9	23.7	13.7
Engineer	32.4	31.9	34.0	32.4	15.7	34.6	15.4	34.9	15.8
Chemist	30.8	31.8	34.2	30.9	17 0	34.7	17.6	34.4	17.9
Production manager	34.3	35.4	37.4	34.2	10.6	36 3	10.8	37.9	11.3
Farmer	37.6	36.7	33.7	34.6	10.7	33.0	11.0	33.9	11.1
Carpenter	21.2	22.1	18.8	17.3	14.3	16.8	14.5	18.2	15.3
Printer	35.7	36.4	34.8	32.1	10.2	32.3	11.1	34.0	10.8
Mathematics-Science teacher	32 8	34.7	33.6	30.6	11.3	31.7	12.3	33.2	12.5
Policeman	29.6	30.6	27.2	26.9	8.7	26.3	9.4	26 8	9.0
Forest service	24.6	25.3	25.6	22.4	12.0	23.9	12.6	25.3	13.1
Y.M.C.A. physical director	25 6	26.3	25 3	23.9	10.1	23.6	10.2	24.6	10.6
Personnel manager	29.0	32.3	35.9	31.9	11.3	33.4	11.9	36.3	11.2
Y.M.C.A. secretary	21.0	22.2	22.5	21.0	11.0	20.3	11.1	21.9	11.5
Social science teacher	28.6	29.8	30.0	27.0	12.0	27.0	12.5	29.0	12.7
City school superintendent	19.9	21.2	23.3	20.7	12.0	22.6	11.4	24.2	11.9
Minister	16.2	16.5	19.2	18.2	10.1	16.6	11.8	20.3	11.7
Musician	30.7	30.5	28.4	28.2	11.4	26.8	13.0	26.9	13.2
Certified public accountant	27.7	29.0	32.1	27.9	9.1	31.5	10.6	31.0	9.7
Accountant	31.1	33.7	34.0	29.9	10.6	31.9	11.9	32.9	10.9
Office worker	36.1	38.1	34 2	34.3	10.2	33.1	11.6	33.5	11.0
Purchasing agent	33 8	34.4	34.1	32.8	10.1	33.4	11.7	33.3	11.5
Banker	28.8	29.8	27.1	26.8	8.9	26.2	9.6	26.8	9.3
Sales manager	31.6	31.6	32.2	32.2	11.2	31.6	12.2	32.2	12.2
Real estate salesman	37.1	37.2	34.3	37.0	9.3	35.3	9.8	34.4	10.3
Life insurance salesman	30.2	29.4	28.0	31.4	12.4	28.7	12.6	28.6	12.8
Advertising man	31.9	31.9	33.8	34.5	9.9	33.9	9.8	34.2	10.5
Lawyer	34.2	33.6	34.0	35.1	11.1	35.5	11.7	34.2	11.7
Author-journalist	31.0	30.6	31.7	32.0	8.8	32.5	9.8	31.3	10.0
President	29.9	29.8	33.4	31.4	8.5	33.0	9.1	33.6	10.0
Occupational Level	54.8	54.8	57.7	57.8	6.4	59.2	7.1	59.0	6.9
Masculinity-Femininity	50.2	51.0	48.3	49.7	10.7	49.8	10.7	50.5	11.0
Interest Maturity	50 3	52.2	53.6	51.7	6.1	53.0	6.4	54.0	6.1
Average of Occupational Scales	28.6	29.4	29.4	28.4	11.3	29.0	12.0	29.5	12.0

1937 scores are reported in Table 70 (p. 267). Critical ratios for the differences in scores between 1927 and 1932, 1932 and 1937, and 1927 and 1937 are given in Table 96 (p. 363). Percentages of A, B+, B, and C ratings of the 285 seniors in 1927 are reported in Table 107 (p. 376). Correlations between test and 1932 retest on 24 of the occupational scales and between test and 1937 retest on 19 of the scales are given in Table 95 (p. 360).

Interest scores of men engaged in certain occupations.—Interest scores on nearly all the scales are given for physicians, dentists, engineers, and lawyers in Table 116, page 418, and for artists, production managers, personnel managers, accountants, sales managers, author-journalists, and presidents in Table 119, page 431.

Scores of various occupations on the artist scale are given in Table 21 (p. 108), and on the accountant scale in Table 22 (p. 109). Scores on the OL scale are given in Table 50 (p. 192), and Table 87 (p. 324); on the MF scale in Table 87; and on the IM scale in Tables 70 (p. 267), and 87 (p. 324).

Scores of medical, dental, engineering, legal, and business students are given in Table 116, p. 418.

INTEREST SCORES OF WOMEN ENGAGED AS NURSES

Table 27 (p. 126) reports the scores of women nurses on 17 scales for the women's blank.

1938 REVISION OF THE MEN'S BLANK AND SCALES

This section supplies various details which are only briefly mentioned in chapter 4, page 62.

Changes in the size and mean age of the criterion-occupational groups are given in Table 197. That the changes in the criterion-occupational groups and in the men-in-general groups (see Tables 185 and 190) are not great is evidenced by the fact that the average of the correlations between 29 original and revised scales is .929 (see Table 197).

The format of the blank has been changed somewhat. Formerly there were two forms for men: Form A for men no longer in school, Form B for students. Form M (following p. 726) replaces both by

providing place on the first page for both sets of personal questions of the two earlier forms. Formerly amusement items constituted Part II and school subject items Part III; now the reverse is the case. Formerly items were not grouped; now they are printed in groups of five[9] as an aid to both marking and scoring the blank.

TABLE 197

SIZE AND AGE OF OLD AND REVISED CRITERION-OCCUPATIONAL GROUPS AND CORRELATION BETWEEN THEM

Occupation	Old Criterion Groups		New Criterion Groups		Correlation between Old and New Scales N=285
	N	Average Age	N	Average Age	
Accountant	332	37.3	345	37.4	.89
Advertising man[a]	60 + 49[b]	37.5	168 + 62	37.6	.95
Architect	114	43.9	244	42.8	.93
Artist	226 + 46	42.6	232 + 46	42.7	.98
Author-Journalist[c]	122	45.2	250	45.0	.92
Aviator	...	....	510	....	...
Banker	...	....	250	45.5	...
Carpenter	107	42.7	185	43.2	.94
Certified public accountant	329 + 68	37.6	355 + 68	37.3	.84
Chemist	148	34.8	293	35.2	.95
City-school superintendent	193	48.0	190	46.5	.91
Dentist	238	42.5	249	42.4	.92
Engineer	382	45.6	513	43.9	.96
Farmer	187	34.6	245	37.6	.92
Forest service	...	....	410	38.5	...
Lawyer	195 + 73	44.3	251 + 73	39.2	.93
Life insurance salesman	220 + 82	40.9	514 + 82	39.9	.93
Mathematician	201	48.1	181	46.1	.97
Mathematics-Science teacher	...	....	228	33.6	...
Minister	245	40.4	255	42.6	.96
Musician	100	33.7	250	32.6	.81
Office man	204 + 16	32.5	326	33.2	.92
Osteopath	...	....	585	37.9	...
Personnel manager	121	42.1	147	41.0	.83

[a] The original advertising criterion group was composed of account executives of advertising agencies; the revised group includes them and advertising managers, mostly of manufacturing concerns.

[b] The two figures 60 + 49 are explained in the footnote on page 694.

[c] The original journalist criterion group was composed primarily of newspaper editors; the revised group includes them and 101 authors. The correlation between the two groups is .89.

[9] Items are printed in groups of four on the women's blank. A forthcoming revision of the women's blank will consist of 400, not 410 items, printed in groups of five.

TABLE 197 (*Concluded*)

Occupation	Old Criterion Groups		New Criterion Groups		Correlation between Old and New Scales N=285
	N	Average Age	N	Average Age	
Physician	337 + 96	43.4	337 + 96	40.9	.96
Physicist	203	46.0	173	43.2	.98
Policeman	259	34.8	259	34.8	.95[d]
President of manufacturing concern	...	....	172	48.0	...
Printer	...	....	258	35.5	...
Production manager	...	....	218	42.8	...
Psychologist	129	48.3	192	42.2	.94
Public-utility salesman	...	....	180	....	...
Purchasing agent	120	38.6	221	39.8	.91
Real estate salesman	126	37.6	246	40.1	.95
Sales manager	...	....	223	42.2	...
Social science teacher	...	....	224	33.7	...
Y.M.C.A. physical director	194	30.0	220	31.4	.95
Y.M.C.A. secretary	99	42.9	113	42.0	.94
Masculinity-Femininity	1206	....	1206	....	.98[e]
Average, not including MF	196 + 18	40.6	255 + 12	40.0	.93

[d] Although the same blanks of policemen are used in both cases, the men-in-general groups are different, twenty less items are used in the revised scales, and the range of weights has been reduced ±15 to ±4

[e] The only change in the two masculinity-femininity scales is that the old scale had a range from 3 to −3 in its weights, whereas the revised scale has a range from 4 to −4. Both scales are based upon 603 pairs of males and females.

Twenty items have been dropped from the 420 items constituting the earlier men's blank, leaving 400 items on the revised form.[10] A few of these items were dropped because of typographical considerations; the remainder because they were the least significant items in differentiating between men in various occupations. The 20 items are: checkers, solitaire, billiards, playing a musical instrument, "Arts and Crafts," cowboy movies, Bible study, penmanship, shorthand, being left to yourself, continuing at same

[10] After we had prepared everything for publication, it was decided to exclude the item "Negro" from the blank, necessitating a complete revision of all of our norms. After that was all finished, it seemed better to have 400 items rather than 399, for every time 399 was mentioned we had to write a letter or stop and explain why we did not use 400; so we restored No. 400, "worry about mistakes." It was, however, too late to make use of such data as we had regarding this item, so that it performs no other function than to round out the number except in recently developed scales such as aviator and osteopath.

work until finished, studying latest hobby, e.g., Einstein theory, Freud, etc., witty people, Negroes, cautious people, methodical people, teetotalers, women cleverer than you are, people who talk very low versus people who talk very loud, people who talk very fast versus people who talk very slowly.

Ten items will be dropped from the earlier women's blank leaving 400 on the forthcoming revised women's form. These ten items are: usually ignore feelings of others, witty people, people who always agree with you, people who talk very loudly, accept just criticism, taking long walks, travel cross-country in auto, very intellectual people, progressive people, women cleverer than you are. These particular items were dropped because they had the lowest total weights on 18 scales and because it was necessary to restrict the blank to 400 to conform to requirements for scoring on the Test-Scoring Machine.

THE VOCATIONAL INTEREST BLANK FOR MEN (REVISED)

A facsimile of the *Vocational Interest Blank* (Form M) follows.

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